1992

ITEM: 3

SUBJECT: Consideration of Approving Department of Pesticide Regulation's 1992 Management Practices for Rice Pesticides

REPORT: In January 1990, the Board adopted a Basin Plan amendment addressing pesticides in surface waters of Basins 5A, 5B and 5C. The implementation program in the amendment includes a prohibition of discharge for irrigation return flows containing the pesticides carbofuran, malathion, methyl parathion, molinate and thiobencarb unless the discharger is following a management practice approved by the Board. To receive approval, the management practices must be expected to meet specified performance goals.

The Department of Pesticide Regulation has submitted proposed management practices to control the discharge of these chemicals from rice fields in 1992. The DPR submittal also contains information that indicates that drift of the pesticides into surface waters during aerial applications is a significant source of the pesticides being detected in the drains. Control of drift during application has been incorporated into this year's program.

During the 1991 rice season, staff conducted an evaluation of the impacts of emergency releases from rice fields and monitored drains in the rice growing regions of Merced County. A report on this work is enclosed and serves as a basis for a recommendation for additional evaluation of the emergency release provisions.

It should be noted that not all of the carbofuran monitoring data was available at the time DPR prepared their submittal. Recommendations regarding the 1992 control program for this pesticide may change following receipt and review of the complete data set.

RECOMMENDATION: **Adopt the proposed resolution approving specific management practices that minimize discharges of carbofuran, malathion, molinate, methyl parathion and thiobencarb.**

Staff also recommends that the Board, by motion, request the Department of Pesticide Regulation to do the following:

1. **Conduct a program to reduce the drift of rice pesticides into surface waters in the 1992 season and report back to the Board on the success of this effort prior to the 1993 season.**

2. Compile a report prior to the 1993 season detailing the need for the emergency releases of water from treated fields. This report should address potential alternatives, the impacts that would result if no emergency releases were allowed, and potential mitigation measures.

3. Restrict emergency releases to situations where the problem is beyond the control of the grower and no other option is available.

4. Incorporate the tarping of field drainage structures as a standard practice to minimize discharges during holding periods.

STAFF REPORT

CONSIDERATION OF APPROVING DEPARTMENT OF PESTICIDE REGULATION'S 1992 MANAGEMENT PRACTICES FOR RICE PESTICIDES

Background

Each year, over 300,000 acres of rice are grown in the Sacramento Valley and nearly all of this acreage is treated with at least one pesticide from mid-April through mid-June. Water quality problems can arise when chemicals are applied to the flooded rice fields, and the tailwater is subsequently released into agricultural drains and the Sacramento River.

In the early 1980's, the rice herbicides molinate and thiobencarb caused large fish kills in Sacramento Valley agricultural drains, and thiobencarb caused taste problems in the City of Sacramento's drinking water supply. In the late 1980's, it was established that three insecticides used on rice fields, carbofuran, malathion and methyl parathion, were present in the drains at concentrations that pose a threat to aquatic resources.

Beginning in 1984, the Department of Pesticide Regulation (DPR, formerly part of the Department of Food and Agriculture), set up the Rice Herbicide Program to implement programs aimed at reducing and controlling the discharges of pesticides from rice fields. In 1990, the Regional Board clarified the objectives of the control programs with the adoption of an amendment to the Water Quality Control Plan (Basin Plan).

The amendment contains a conditional prohibition of discharge for five rice pesticides: carbofuran, malathion, methyl parathion, molinate, and thiobencarb. The discharge of irrigation return flows containing these pesticides is prohibited unless the discharger is following a management practice approved by the Board. To be approved, the practice must be expected to meet specified "performance goals" in all waters designated as freshwater habitat. The Basin Plan contains the 1992 performance goals for carbofuran, methyl parathion and molinate, but the Board will have to set this year's performance goals for malathion and thiobencarb.

DPR has submitted the results of the 1991 rice pesticide control program and has proposed management practices to meet the Board's 1992 performance goals. This report reviews the proposed practices and recommends Board action.

1992 Performance Goals

The performance goals are intended to bring surface water pesticide concentrations down to levels that approach water quality objectives. As found in the Basin Plan amendment, some of the performance goals are lowered each year, and some remain constant. Listed below are the performance goals set for 1991 and 1992:

Chemical	1991	1992
carbofuran	0.4 µg/l	0.4 µg/l
molinate	20 µg/l	10 µg/l
methyl parathion	0.26 µg/l	0.13 µg/l
thiobencarb	1.5 µg/l	not set
malathion	0.. µg/l	not set

For thiobencarb and malathion, the Basin Plan states that "*the Regional Board will review the latest technical and economic information to determine if the performance goal should be adjusted.*"

Staff have not received any technical or economic information concerning malathion, and are not aware of any aquatic toxicity studies being conducted on it. The 1991 performance goal is equivalent to the EPA aquatic criterion for malathion and should be sufficient to protect beneficial uses. Staff recommends that the Board retain the same level of 0.1 µg/l malathion as the 1992 performance goal.

In regards to thiobencarb, staff have received a letter from the manufacturer, Valent, requesting a reevaluation of the performance goal (see Attachment 1). In addition, two technical reports[1] have recently been published which contain suggested water quality criterion for thiobencarb. The State Water Resources Control Board's recommended criterion for protection of aquatic resources is 1.6 µg/l (14 day running average) and the Department of Fish and Game's criterion is 3.1 µg/l.

In 1991, thiobencarb levels were below the 1.0 µg/l detection level at all drain sites, illustrating the effectiveness of approved management practices. While the recommended criteria may suggest that higher concentrations may be safe for aquatic organisms, staff recommends that the Board's 1992 performance goal for thiobencarb be set at the same level as in 1991, at 1.5 µg/l.

DPR Recommended Management Practices

As in previous years, the Department of Pesticide Regulation (DPR) was requested to provide (1) pesticide use and water quality monitoring data developed during the 1991 season, and (2) any recommendations regarding management practices that would meet the 1992 performance goals. Attachment 2 contains a summary of the information submitted by DPR.

Table 1 compares the major components of the 1991 rice herbicide control program with DPR's suggested program for 1992. No change in the DPR regulatory program is recommended for carbofuran, methyl parathion, malathion, or thiobencarb. DPR proposes to add an additional half-life, 4 days, to the molinate holding time. Several of the elements discussed by DPR are addressed below.

1991 Water Quality Monitoring Results

The results of the annual monitoring activities are discussed on pages 7-9 of the DPR submittal, while tables and graphs of the results are found on pages 18-34. A summary of the monitoring, including the 1991 performance goals, is given in Table 2. The results are good, especially considering that 1991 was the fifth year of drought, and little or no fresh water flowed through the agricultural drains to dilute the rice field discharges.

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[1]State Water Resources Control Board's "Sacramento River Toxic Chemical Risk Assessment Project" (October 1990), and Department of Fish and Game's "Hazard Assessment of the Rice Herbicides Molinate and Thiobencarb to Aquatic Organisms in the Sacramento River System" (1990).

TABLE 2
MONITORING SUMMARY

Pesticide	1991 Performance Goal µg/l	Maximum Concentration In The Sacramento Valley µg/l	Maximum Concentration In Colusa Basin Drain At Knights Landing µg/l
molinate	20	26	18
thiobencarb	1.5	ND	ND
carbofuran*	0.4	0.6	ND
methyl parathion	0.26	0.3	0.2
malathion	0.1	0.3	0.11

ND = not detected. The detection level was 1.0 for thiobencarb and 0.1 for carbofuran.
*Note: Not all of the monitoring data for carbofuran is available at this time.

The only pesticide detected at the City of Sacramento drinking water intake was molinate. The peak concentration at this site was 0.6 µg/l, which is well below the 20 µg/l maximum contaminant level for drinking water. This product is removed by the treatment process and has never been detected in the city's tap water.

Mass transport is a measure of the amount of chemical, in pounds per day, in a water body. Although mass transport numbers can not be used to determine compliance with water quality goals, they are a good method of measuring the success of the rice herbicide program from year to year. The total mass transport of molinate in the Sacramento River at Sacramento dropped significantly in 1991. It was reduced 96.9% from 1990 levels, and has been reduced 99.5% since 1982 (40,667 pounds in 1982 versus 218 pounds in 1991).

Aerial drift

A majority of rice pesticide application occurs by air. Inherent in this application method is the potential for the chemicals to drift into adjacent surface waters. DPR has compiled evidence (pages 10-11 of Attachment 2) indicating that aerial drift was a significant contributor of rice pesticides in surface waters during 1991. This appears to be the first year in which pesticide discharges from fields were low enough that the impact of aerial drift could be seen. However, as field discharges continue to decrease (through the management practices approved by the Board), aerial drift will become a relatively larger contributor to overall rice pesticide levels measured in surface waters.

DPR staff have been consulting with county agricultural commissioners, aerial applicators, and pesticide enforcement staff in an effort to best determine how to reduce the impact of aerial drift. Although DPR is not ready at this point to reveal their control program, they do plan to present an update on their efforts at the February Board meeting. Staff concur with DPR regarding their evidence implicating aerial drift, and feel that increased controls are necessary to reduce the concentration of rice pesticides in surface waters.

Tarping of Rice Boxes

While drift is the most likely source of the high concentrations observed during the peak of the pesticide applications, another possible source is leakage of rice field tailwater through closed outlet structures called rice boxes. Such leakage can be effectively prevented by placing a tarp on the field side of the box and holding it in place with soil. This practice is already required in some, but not all, counties.

While not a feature of the DPR submittal, DPR staff agree that this is a reasonable approach to eliminating a potential source of low volume but high concentration discharges.

Emergency Releases

Ever since the beginning of the rice herbicide control program, there has been a provision allowing growers to obtain an emergency release of water from pesticide-treated fields prior to the end of the standard holding time. The purpose of this provision is to prevent loss of the crop when weather, soil, or other conditions combine with the impacts of the pesticide to stress the rice seedlings. Upon submittal of a written request, a county agricultural commissioner may authorize an emergency release of water to the extent necessary to restore a healthy growing environment. For the 1987-1989 growing seasons, an average of 1.4% of the rice acreage was granted an emergency release. However, in 1990, emergency releases rose dramatically to 6.3% of the rice acreage, with most of the releases occurring immediately after unseasonably heavy rain.

During Board approval of the 1991 rice management practices, concern was expressed about the emergency release provision. Staff was instructed to determine the impact emergency releases have on the measured discharges of pesticides from rice fields, and whether emergency releases really are a necessary component of the control program.

Staff conducted an analysis of the emergency releases which were granted during the 1991 rice season. The results of the study are found on pages 3-15 of the staff report "*1991 Rice Pesticide Special Studies: Emergency Release Discharges and Merced County Discharges.*" (The report is attached.) Emergency releases were granted to 0.8% of the total rice acreage in 1991. However, staff has calculated that approximately 15% of the molinate measured at the Colusa Basin Drain at Highway 20 was due to emergency releases (see Attachment 3).

A provision of the 1991 program was the requirement that a grower who desired an emergency release complete a detailed application form before release began, and then record the volume of water discharged during release (pages 36-37 of Attachment 2). Among other items, the grower is required to state the reason for discharge and to list the steps he can take to prevent emergency releases in the future. For the 1992 program, DPR again includes the requirement that these forms be submitted. DPR feels that the forms should help the county agricultural commissioners verify a legitimate need for an emergency release. Staff recommends that the Board request DPR to instruct the county agricultural commissioners not to approve an emergency release request unless there is a demonstrated problem beyond the control of the grower, and no other option is available. Also, the emergency releases should be

closely monitored to ensure that only the volume of water needed to mitigate the problem is discharged.

As shown in Table 3, water discharged under an emergency release contains considerably higher concentrations than discharges following the standard holding time. With the insecticides in particular, this has the potential to produce toxic concentrations in the receiving waters. Because of this, staff recommends that the Board request a full reevaluation of the need for emergency releases prior to the 1993 season.

TABLE 3
CONCENTRATIONS AT END OF STANDARD HOLDING TIME VERSUS EMERGENCY RELEASE

Pesticide	1992 Performance Goal µg/l	Concentration in water at the end of the standard holding time µg/l	Concentration in water at the end of the minimum holding time required for an emergency release µg/l
Carbofuran	0.4	13.1	7.4
Methyl Parathion	0.13	0.15	3.2
Molinate	10	26	635

References: (1) Nicosia et al, 1990. Off-Field Movement and Dissipation of Soil-Incorporated Carbofuran from Three Commercial Rice Fields and Potential Discharge in Agricultural Runoff Water. CDFA No. EH 90-4. (2) Oshima, 1992. DPR memo to Regional Board: Methyl Parathion Data. (3) Scardaci, et al, 1987. Evaluation of Rice Water Management Practices on Molinate Dissipation and Discharge, Rice Pests and Rice Production. Agronomy Progress Report No. 200.

Carbofuran

The information submitted by DPR on 10 January does not contain all of the 1991 carbofuran monitoring data. DPR recommended management practices and staff recommendations are based on the available data. Additional data may be available prior to the Board meeting and recommendations regarding the 1992 management practices for this chemical may change.

Methyl parathion

The Department of Fish and Game has notified the Board that the performance goals for methyl parathion will not fully protect aquatic life (Attachment 4). The 1992 performance goal is 0.13 µg/l, which is half of the 1991 goal of 0.26 µg/l. Staff anticipates that the program proposed by DPR will meet the performance goal as long as the drift control effort is effective.

In 1993 the Board will have the opportunity to set a new performance goal for methyl parathion. At that time, the Board can consider the latest information on aquatic toxicity. If, however, the Board feels that it is necessary to reduce concentrations on an emergency basis, it could approve extended holding times and/or not approve the emergency release provision.

Molinate

The performance goal for molinate decreases from 20 µg/l in 1991 to 10 µg/l in 1992. Monitoring during the 1991 season showed that the control program was highly successful, with all but three samples below the 20 µg/l limit. However, staff agree with DPR that it is necessary to add an additional half life (4 days) onto the molinate holding time in order to meet the stricter 1992 performance goal. Discharges will be further reduced by controlling drift into surface waters during application

Malathion and Thiobencarb

No changes in use restrictions are proposed for malathion and thiobencarb. Additional reductions in discharges to surface waters should be achieved through control of drift during aerial applications.

Recommendations

Staff recommends that the Board approve the proposed resolution. The resolution sets a 1992 performance goal for malathion of 0.1 µg/l, and a performance goal for thiobencarb of 1.5 µg/l. It also approves the management practices proposed by DPR a long as there is also a program to minimize the drift of the pesticides into surface waters during application. (The recommendation regarding carbofuran management practices may change following the receipt and review of the remainder of the monitoring data.)

Staff also recommends that the Board, by motion, request the Department of Pesticide Regulation to do the following:

1. Conduct a program to reduce the drift of rice pesticides into surface waters in the 1992 season and report back to the Board on the success of this effort prior to the 1993 season.

2. Compile a report prior to the 1993 season detailing the need for the emergency releases of water from treated fields. This report should address potential alternatives, the impacts that would result if no emergency releases were allowed, and potential mitigation measures.

3. Restrict emergency releases to situations where the problem is beyond the control of the grower, and no other option is available.

4. Incorporate the tarping of field drainage structures as a standard practice to minimize discharges during holding periods.

TABLE 1

COMPARISON OF THE 1991 MANAGEMENT PRACTICES,
AND PROPOSED 1992 MANAGEMENT PRACTICES,
FOR
CARBOFURAN, METHYL PARATHION, MALATHION, MOLINATE, AND THIOBENCARB

Management Practice	1991 Management Practice	1992 Practice Proposed by Dept. of Pesticide Regulation
CARBOFURAN		
Incorporation of material into soil	Entire field	Same as 1991
Holding times for most individual fields	24 days following application	Same as 1991
Holding times for closed water agencies, ponding on fallow land, or other systems	25th day following last application w/in system	Same as 1991
Holding times for fields within closed water agencies	9 days following application	Same as 1991
Emergency releases	After 7 days, with written request and follow-up paperwork	Same as 1991
METHYL PARATHION		
Holding time for most individual fields	24 days following application	Same as 1991
Holding time for closed water agency, ponding on fallow land, or other system	25th day following the last application within the system	Same as 1991
Emergency releases	After 7 days, with written request and follow-up paperwork	Same as 1991
MALATHION		
Holding time for all fields	4 days following application (voluntary practice)	Same as 1991
Emergency releases	Not necessary	Same as 1991

Table 1, continued

Management Practice	1991 Management Practice	1992 Practice Proposed by Dept. of Pesticide Regulation
MOLINATE		
Holding time for most individual fields	24 days; after this, discharge not to exceed 2" over weir for first 7 days	28 days; after this, discharge not to exceed 2" over weir for first 7 days
Holding time for closed water agencies, ponding on fallow land, or other system	25th day following the last application within the system	29th day following last application within the system
Holding time for fields within closed system and fields in specific "low discharge" areas	9th day following application	Same as 1991
Emergency releases	After 7 days, with written request and follow-up paperwork	Same as 1991
THIOBENCARB		
Holding time for most individual fields within Sacramento River basin	30 days following application	Same as 1991
Holding time for closed water agencies, ponding on fallow land, or other system	20 days following the last application within system	Same as 1991
Holding time for fields within closed system and fields in specific "low discharge" areas	7 days following application	Same as 1991
Holding time for individual fields within San Joaquin River basin	6 days following application	Same as 1991
Voluntary sales limit	Enough material to treat 110,000 acres	Same as 1991
Emergency releases	Not permitted	Same as 1991
ALL CHEMICALS		
Reduce aerial drift during pesticide application onto rice fields	Not considered	Control measures to be developed before the start of the rice season

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

RESOLUTION NO.

APPROVAL OF MANAGEMENT PRACTICES FOR THE DISCHARGE
OF IRRIGATION RETURN FLOWS CONTAINING
CARBOFURAN, MALATHION, METHYL PARATHION, MOLINATE AND THIOBENCARB IN 1992

WHEREAS, The California Regional Water Quality Control Board, Central Valley Region, (hereafter Board) adopted the second edition of the Water Quality Control Plan (hereafter Basin Plan) for the Sacramento River, Sacramento-San Joaquin Delta and San Joaquin Basins; and

WHEREAS, The State Water Resources Control Board (hereafter State Board) approved the Basin Plan on 22 March 1990; and

WHEREAS, The Board adopted an amendment to the Basin Plan addressing pesticides in inland surface waters on 26 January 1990; and

WHEREAS, The 26 January 1990 amendment to the Basin Plan was approved by the State Board on 15 February 1990; and

WHEREAS, The Basin Plan amendment prohibits discharge of irrigation return flows containing the pesticides carbofuran, malathion, methyl parathion, molinate and thiobencarb unless the discharger is following a management practice approved by the Board; and

WHEREAS, The 1992 performance goals established in the Basin Plan amendment for carbofuran, methyl parathion, and molinate are 0.4 μg/l, 0.13 μg/l and 10 μg/l, respectively, and apply to all waters designated as freshwater habitat; and

WHEREAS, The Basin Plan does not specify 1992 performance goals for malathion and thiobencarb, but indicates that the Board will evaluate the latest technical and economic information to determine if the previous year's performance goal should be adjusted; and

WHEREAS, The 1991 performance goals for malathion and thiobencarb of 0.1 μg/l and 1.5 μg/l appear to be achievable, protective of beneficial uses and appropriate for 1992; and

WHEREAS, The Department of Pesticide Regulation (DPR) has a Rice Pesticide Control Program to reduce the off-target movement of pesticides applied to rice fields; and

WHEREAS, In a 10 January 1992 submittal titled "Information on Rice Pesticides," DPR proposes a list of management practices that will control the discharge of carbofuran, malathion, methyl parathion, molinate and thiobencarb from rice fields; and

WHEREAS, The DPR submittal indicates that drift of pesticides during aerial application may be a significant source of the pesticide residues being found in Sacramento Valley waters; and

WHEREAS, The management practices contained in the DPR submittal should result in compliance with the 1992 performance goals if there is an effective program to control the drift of pesticides into surface waters following aerial applications; and

WHEREAS, The action to approve management practices for the discharge of irrigation return flows containing the pesticides carbofuran, malathion, methyl parathion, molinate, and thiobencarb during 1992 is exempt from the provisions of the California Environmental Quality Act, in accordance with Sections 15304, 15307, and 15308, Title 14, California Code of Regulations; and

WHEREAS, The control program for these five pesticides was considered in the Functional Equivalent Document prepared for the 26 January 1990 Basin Plan amendment; and

WHEREAS, The Board, in a public meeting, heard and considered all comments pertaining to the proposed management practices for the control of discharges containing the five pesticides: Therefore be it

RESOLVED, That the malathion and thiobencarb performance goals for 1992 will remain the same as they were in 1991 and the Board approves the management practices in the 10 January 1992 DPR submittal as appropriate for the discharge of irrigation water return flows containing carbofuran, malathion, methyl parathion, molinate and thiobencarb in 1992 if DPR conducts an effective program to reduce drift of aerial applications into surface waters.

I, WILLIAM H. CROOKS, Executive officer, do hereby certify the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board on 28 February 1992.

WILLIAM H. CROOKS, Executive Officer

ATTACHMENT 1

1333 North California Blvd
Suite 600
P.O. Box 8025
Walnut Creek, CA 94596-8025
(415) 255-2700

VALENT.

January 30, 1991

**REQUEST FOR REEVLAUTION
OF THIOBENCARB PERFORMANCE
GOALS-SACRAMENTO RIVER BASIN
771.211 CA Bolero**

Via Overnight Mail

Mr. Rudy Schnagl
California Regional Water Quality
Control Board
Central Valley Region
3443 Routier Road
Suite A
Sacramento, CA 95827-3098

Dear Mr. Schnagl:

Valent U.S.A. Corporation, agent for rice herbicide thiobencarb registrant Chevron Chemical Company, asks the Regional Board to initiate a reevaluation of the performance goal on thiobencarb. The 1991 goal set by the Board is 1.5 ppb, expressed as a daily maximum. Valent understands that the Board will be meeting in February and if that meeting is the appropriate forum for consideration of this request, then Valent respectfully asks that it be placed on the Board's meeting agenda.

Our request is provoked by two reports issued in 1990 by separate State Agencies which indirectly raise questions about whether the Regional Board's 1991 performance goal for thiobencarb is unnecessarily severe. In the Water Resources Control Board's Sacramento River Toxic Chemical Risk Assessment Project (90-11WQ October 1990) and the Department of Fish and Game's Hazard Assessment of the Rice Herbicides Molinate and Thiobencarb to Aquatic Organisms in the Sacramento River System (Administrative Report 90-1 1990) thiobencarb water criteria are 1.6 µg/L (14-day running average) and 3.1 µg/L (maximum concentration) respectively. Both reports provide extensive discussion of thiobencarb toxicity to aquatic organisms and provide an assessment not available to the Regional Board at the time the 1991 performance goal was established.

In light of those studies' findings, Valent believes that the daily maximum measurement for thiobencarb should be changed either to a 14-day running average, or that the current performance goal.

indicative more of chronic exposure protection, be translated to an acute value more fairly representative of the scientific data. One method for that translation may be found in the California Ocean Plan where daily maxima are calculated at 4x the conservative estimate of chronic toxicity. (Ref. 1). Since the State Board calculates in its 1990 report that thiobencarb has a conservative estimate of chronic toxicity of 1.6 ppb (which includes a 10 fold margin of safety) then the daily maximum for the chemical would be 6.4 ppb.

Please let me know if you have any questions. My telephone number is (415) 256-2728.

Sincerely,

Therese St. Peter
State Regulatory Affairs Manager

TSP:tal/317

1. SWRCB (State Water Resources Control Board). Final Environmental Impact Report. Amendment of the Water Quality Control Plan for Ocean Waters of California. Volume I. Approved November 17, 1983 (Resolution No. 83-87). 134 pp.

Department of Pesticide Regulation
Information on Rice Pesticides
Submitted to the Central Valley Regional Water Quality Control Board
January 10, 1992

Programs were implemented since 1983 to reduce discharges of the rice herbicides molinate (Ordram®) and thiobencarb (Bolero®) into surface waterways. In 1990, the objectives of these control efforts were clarified and expanded, following the adoption of amendments to the Central Valley Regional Water Quality Control Board's (Regional Board's) water quality control plan. This plan established performance goals for molinate and thiobencarb, beginning in 1990, and for the insecticides carbofuran (Furadan®), methyl parathion, and malathion, beginning in 1991.

The information provided reviews the factors affecting quantities of molinate, thiobencarb, carbofuran, methyl parathion, and malathion discharged to agricultural drains and the Sacramento River and efforts to meet 1991 performance goals. A summary of pertinent water quality monitoring efforts is also provided. Programs are proposed which will reduce discharges of molinate, thiobencarb, carbofuran, methyl parathion, and malathion to levels which comply with 1992 performance goals.

1991 PROGRAM

PROGRAM DESCRIPTIONS

Molinate

The 1991 molinate program was designed to meet water quality objectives and the 1991 performance goal of 20 parts per billion (ppb) molinate in Sacramento Valley surface waters. The program was implemented using restricted material permits conditioned to mitigate water quality problems associated with use. The conditions included:

1. All water treated with products containing molinate had to be retained on the site of application for at least 24 days following application unless:

a. the treated water was contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system could discharge 25 days following the last application of molinate within the system.

   1. If the system was under the control of one permittee, treated water could be discharged from the application site in a manner consistent with product labeling.

   2. If the system was under the control of more than one permittee, treated water could be discharged from the application site 9 days following application.

b. the treated water was on acreage within the bounds of specific geographic areas that discharged negligible amounts of rice field drainage into the Sacramento River or its tributaries until fields were drained for harvest. All water on fields treated with molinate had to be retained on the treated acreage for at least 8 days following application.

2. Fields not specified in 1.a. and 1.b. could resume discharging field water 25 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields could then resume after 7 days.

3. The county agricultural commissioner could authorize the emergency release of tailwater 7 days following application following a review of a written request (Appendix 1) which clearly demonstrated that the crop was suffering because of the water management requirements. Under an emergency release variance, tailwater could be released only to the extent necessary to mitigate the documented problem. Those issued an emergency release had to submit to the county agricultural commissioner a report (Appendix 2) indicating the time and duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release.

Thiobencarb

The 1991 thiobencarb program was designed to meet water quality objectives and the 1991 performance goal of 1.5 ppb thiobencarb in Central Valley surface waters. The program was implemented using restricted material permits conditioned to mitigate water quality problems associated with use. The conditions included:

1. All water treated with products containing thiobencarb north of the line defined by Roads E10 and 116 in Yolo County and the American River in Sacramento County had to be retained on the treated fields for at least 30 days following application unless:

a. the treated water was contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system could discharge 20 days following the last application of thiobencarb within the system.

   1. If the system was under the control of one permittee, treated water could be discharged from the application site in a manner consistent with product labeling.

   2. If the system was under the control of more than one permittee, treated water could be discharged from the application site 7 days following application.

b. the treated water was on acreage within the bounds of specific geographic areas that discharged negligible amounts of rice field drainage into the Sacramento River or its tributaries until fields were drained for harvest. All water on fields treated with thiobencarb had to be retained on the treated acreage for at least 6 days following application.

2. All water treated with products containing thiobencarb south of the line defined by Roads E10 and 116 in Yolo County and the American River in Sacramento County had to be retained on the treated fields for at least 6 days following application.

Valent Chemical Company, distributor of products which contain thiobencarb, agreed to limit the distribution of thiobencarb for use on properties described in 1. above to 4.4 million pounds or enough to treat 110,000 acres. An additional 440,000 pounds could have been used if, on May 1, 1991, flows in the Sacramento River at the "I" Street Bridge in Sacramento were forecast to exceed 15,000 cubic feet per second.

Carbofuran

The 1991 carbofuran program was designed to make progress toward the 1991 performance goal of 0.4 ppb in Central Valley surface waters. The program was implemented using restricted material permits that were conditioned to mitigate water quality problems associated with use. Provisions of this program included:

1. Pre-flood applications of carbofuran to rice fields had to be incorporated into the soil.

2. Water could not be discharged from fields treated with carbofuran for at least 24 days following initial flooding (pre-flood application) or following application (post-plant application) unless the treated water was contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system could be discharged 25 days following the last application of carbofuran within the system.

   a. If the system was under the control of one permittee, treated water could be discharged from the application site in a manner consistent with product labeling.

   b. If the system was under the control of more than one permittee, treated water could be discharged from the application site 9 days following application.

3. The county agricultural commissioner could authorize the emergency release of tailwater 7 days following application following a review of a written request (Appendix 1) which clearly demonstrated that the crop was suffering because of the water management requirements. Under an emergency release variance, tailwater could be released only to the extent necessary to mitigate the documented problem. Those issued an emergency release had to submit to the county agricultural commissioner a report (Appendix 2) indicating the time and

duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release.

Methyl parathion

The 1991 methyl parathion program was designed to meet water quality objectives and the 1991 performance goal of 0.26 ppb methyl parathion in Sacramento Valley surface waters. The program was implemented using restricted material permits that were conditioned to mitigate water quality problems associated with use. The conditions included:

1. Water could not be discharged from fields treated with methyl parathion for at least 24 days following application unless the treated water was contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system could be discharged 25 days following the last application of methyl parathion within the system. Treated water could be discharged from the application site in a manner consistent with product labeling.

2. The county agricultural commissioner could authorize the emergency release of tailwater 7 days following application following a review of a written request (Appendix 1) which clearly demonstrated that the crop was suffering because of the water management requirements. Under an emergency release variance, tailwater could be released only to the extent necessary to mitigate the documented problem. Those issued an emergency release had to submit to the county agricultural commissioner a report (Appendix 2) indicating the time and duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release.

Malathion

The 1991 malathion program was designed to help meet water quality objectives and the 1991 performance goal of 0.1 ppb malathion in Sacramento Valley surface waters. The program was voluntary because malathion users are not required to obtain restricted material permits. It consisted of a single practice: water should be held on the site of application for at least 4 days following application.

DISCUSSION

The California Department of Pesticide Regulation (CDPR), formally part of the California Department of Food and Agriculture (CDFA), implemented the programs through county agricultural commissioners. Restricted material permits issued for the use of molinate, thiobencarb, carbofuran, and methyl parathion included conditions with the requirements presented above. When permits were issued, a handout (Appendix 3) explaining the voluntary malathion program was provided. Compliance with permit conditions was enforced by the commissioners.

Molinate

The molinate program retained the basic strategies of earlier programs, but in 1991 the water holding requirement for most molinate users increased by five days over the requirement used in 1990. Because the half-life of molinate in treated rice field water is usually three to four days, this new requirement would help reduce peak concentrations of molinate in water discharged by individual growers and help meet the molinate performance goal. Treated water could be recirculated, discharged to fallow fields, or otherwise contained as long as it was not discharged from the system until the 25th day following the last application of molinate to water in the system. If the water in the system was under the control of one permit holder (e.g. contained in a single-grower recirculating system), treated water could be released from the site of application after label requirements (water held 4 days or until weeds were killed) were met. This allowed individual rice growers to manage water on their property with the maximum flexibility. In multi-grower systems which contain discharges from more than one permit holder (e.g. Reclamation District 108), individual permit holders could not discharge treated water into the system until the 9th day following application. The additional dissipation of molinate provided by the additional holding requirement on the site of application helped protect aquatic resources in the public waterways that are presumably part of these multi-grower systems.

The molinate program also included a provision which allowed molinate users to discharge treated water on an emergency basis before the end of the 24 day post-application holding period with the approval of the county agricultural commissioner. Requests for such discharges had to include an inspection report by a licensed pest control advisor, demonstrating that the rice crop was threatened by problems aggravated by the long holding requirement. Only enough water could be discharged to ameliorate the problem.

Thiobencarb

The thiobencarb program also retained the basic structure of earlier programs. Strict water management requirements and a sales limit in the Sacramento Valley of 4.4 million pounds of formulated product were adequate to meet the 1991 performance goal for thiobencarb (1.5 ppb). A similar program was implemented in 1990 with qualified success. Concentrations of thiobencarb in 1990 were kept below detectable levels except immediately following unusual May rains when concentrations at one site reached 2.0 ppb.

Carbofuran

Efforts were made to reduce the discharges of carbofuran from rice fields for the first time in 1991 in an attempt to meet the performance goal of 0.4 ppb. For most fields, where carbofuran was incorporated into soil prior to flooding, permit conditions prohibited the discharge of water from fields to state waters for 24 days following flooding. In fields that were treated after field water was drained, the holding time began with the application. For most fields treated with carbofuran, the 24-day holding times were long enough to overlap with the holding times which follow molinate and thiobencarb applications. Thus, the program provided a carbofuran dissipation period of over a month in most

cases. Provisions of the carbofuran program permitted users to manage field water in single- or multi-grower systems as was provided in the molinate program. An emergency release provision, similar to that available to molinate users, was available to carbofuran users.

Methyl parathion

A methyl parathion performance goal (0.26 ppb) was in place for the first time in 1991 and a discharge reduction program was implemented. Like the carbofuran program, this program required that field water be held on the site of application or within approved water management systems until the 25th day following application. An emergency release provision, similar to that available to molinate users, was available to methyl parathion users.

Malathion

The program to reduce discharges of malathion to surface waterways was voluntary since malathion is not a restricted material and use is not subject to use requirements or permit conditions. Information was provided to rice growers explaining the program when they obtained restricted material permits for other rice pesticides.

USE OF SELECTED PESTICIDES IN 1991

In the rice-growing counties in the Central Valley, county agricultural commissioners record the acreage treated with molinate, thiobencarb, carbofuran, and methyl parathion when Notices-of-Application (NOAs) are submitted to each county office. Based on these records, and on pesticide use reports where available, it was estimated that 326,122 acres were treated with molinate, 24,099 with thiobencarb, 121,517 with carbofuran, and 58,286 with methyl parathion (Table 1). Malathion use on rice was determined by reviewing pesticide use reports; it totalled 9,772 acres. Pesticide use report data for another important rice pesticide, bensulfuron methyl (Londax®), are not available yet. Assuming that use patterns of bensulfuron methyl in 1991 reflected those of 1990 when about 374,000 of the 390,000 planted acres were treated, one can estimate that about 307,000 acres, or about 96% of the 320,000 planted acres were treated with bensulfuron methyl in 1991. Pesticide use in rice was lower than in 1990, reflecting a reduction of rice acreage due to drought.

COUNTY AGRICULTURAL COMMISSIONERS AND ENFORCEMENT ACTIVITIES

The county agricultural commissioners are responsible for the enforcement of the rice pesticide programs. The role of the commissioners and their staffs include explaining the program to growers, pest control advisers and operators; issuing restricted material permits; inspecting fields for compliance; approving emergency release variances; and providing CDPR with information on the use of pesticides.

Before any material on the list of California restricted materials may be applied, growers must obtain a permit from their county agricultural commissioner. The permits may specify conditions for use of the

material, including post-application water holding requirements. A Notice-of-Intent (NOI) must be filed with the county agricultural commissioner 24 hours prior to the application, providing the commissioners with the option to observe the mixing, loading, and application of the material, thus enforcing regulations which pertain to pest control operations. Molinate, thiobencarb, carbofuran, and methyl parathion are currently California restricted materials; malathion is not. Permits which specify post-application water holding requirements, like those for the use of molinate, thiobencarb, carbofuran, and methyl parathion also require that the NOA be filed within 24 hours after the application. Staff of county agricultural commissioners and of CDPR made 4,175 inspections of Sacramento Valley rice fields for compliance with water holding requirements; 28 violations were noted.

County agricultural commissioners had the ability to grant variances on the holding requirements for fields treated with molinate, carbofuran, and methyl parathion if the length of the holding time was adversely affecting the rice plants. Those granted such variances were instructed to drain water only to the extent necessary to restore a healthy growing environment for the rice seedlings.

County agricultural commissioners granted variances for 2,718 acres of rice: 2,224 of the 326,122 acres treated with molinate (Table 2), 1,443 of the 121,517 acres treated with carbofuran, and 1,007 of the 58,286 acres treated with methyl parathion. Most of those acreages were lowered only a few inches in order to correct problems caused by deep water and unfavorable weather conditions. Regional Board staff are compiling information on these emergency releases and their potential impacts on water quality.

COOPERATIVE WATER QUALITY MONITORING PROGRAM

Summaries of the monitoring activities addressing molinate, thiobencarb, bensulfuron methyl, carbofuran, methyl parathion, and malathion in Sacramento Valley waterways in 1991 are presented below. Locations of monitoring sites referenced in this report are presented in Figure 1. Their abbreviations can be interpreted as follows:

CBD1	Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County, near its outfall on the Sacramento River.
CBD5	Colusa Basin Drain at Highway 20 in Colusa County.
BS1	Butte Slough at Highway 20 in Sutter County.
SS1	Sacramento Slough at the Department of Water Resources gauge station in Sutter County, near its outfall on the Sacramento River.
SRRUN4	Sacramento River, approximately 3 km downstream from confluence with Colusa Basin Drain, midchannel.
SR1	Sacramento River at Village Marina, approximately 1.5 km upstream from confluence with American River, in Sacramento County.
SR2	Sacramento River at Freeport Bridge in Sacramento County.

SRRAW Sacramento River at the intake to the water treatment facility in Sacramento, approximately 0.3 km downstream from confluence with American River, in Sacramento County.

Molinate and thiobencarb - The molinate and thiobencarb monitoring program in the Sacramento Valley consisted of semi-weekly samples collected from the agricultural drains and the Sacramento River from mid-May through early July by the Department of Fish and Game (DFG). During early May, the early part of the molinate and thiobencarb use period, samples were collected only once a week. Samples were delivered to ICI Americas Inc., manufacturer of Ordram, for molinate and thiobencarb analyses. Split samples representing about 20% of the total collected were analyzed by the DFG laboratory for the presence of both compounds for quality assurance.

The City of Sacramento analyzed water samples collected from the Sacramento River at the intake to its water treatment plant from May 10 through June 19. Samples were collected about three time a week.

Bensulfuron methyl - The DFG collected water samples from the Colusa Basin Drain at CBD1 and Sacramento Slough at SS1 twice each week from May 27 through June 14. After reviewing pesticide use patterns, 8 of the 16 samples were selected on the basis that they would contain the highest bensulfuron methyl concentrations. Bensulfuron methyl has yet to be detected in surface waters at concentrations that are of concern. The samples were analyzed by Morse Laboratories in Sacramento under contract with E. I. du Pont de Nemours and Company, manufacturer of Londax.

Carbofuran - Samples were collected by DFG from the Colusa Basin Drain at CBD1 and CBD5, Sacramento Slough (SS1), and Sacramento River (SR1) twice weekly from April 15 through June 24. Analyses were performed by FMC Corporation who markets Furadan. About 30% of the samples were split with DFG, whose laboratory analyzed the samples for quality assurance.

Methyl parathion and malathion - Samples were collected by DFG from the Colusa Basin Drain at CBD1 and CBD5, Sacramento Slough (SS1), and the Sacramento River (SR1) twice weekly from May 2 through June 13. Analyses were performed by DFG. About 30% of the samples were split with the CDFA laboratory, who analyzed the samples for quality assurance.

RESULTS OF MONITORING PROGRAM

Molinate - Concentrations of molinate in samples collected from agricultural drains and the Sacramento River are presented in Table 3. The highest concentration of molinate detected in these waterways in 1991 was the 26 ppb in Butte Slough (BS1) on June 6 (Figure 2). The highest concentration detected in the Colusa Basin Drain, historically the waterway with the highest concentrations of molinate, was 18 ppb. Figure 3 illustrates peak concentrations of molinate at CBD1 in the years 1981 - 1991, compared to the performance goals established for molinate.

The highest concentration of molinate detected in the Sacramento River was 1.3 ppb in a sample collected from SR1 on June 3. Molinate concentrations detected by the City of Sacramento at the intake to its water treatment facility on the Sacramento River are presented in Table 4. Concentrations peaked on June 3 when 0.6 ppb; a peak of 6.5 ppb was found there in 1990 (Figure 4).

Thiobencarb - No thiobencarb was detected in agricultural drains or the Sacramento River in 1991 (Tables 4 and 5). A perspective of concentrations of thiobencarb at CBD1 and SRRAW are presented in Figures 5 and 6, respectively.

Bensulfuron methyl - Concentrations of bensulfuron methyl detected at CBD1 and SS1 are presented in Table 6. The highest concentration was 0.825 ppb, detected in a sample collected at CBD1 on June 10.

Carbofuran - Results of carbofuran analyses performed by FMC and DFG are presented in Table 7. The peak concentration of carbofuran observed in this survey was 0.6 ppb, detected in a water sample taken from the Colusa Basin Drain at CBD5 on May 9 (Figure 7). Carbofuran was not detected in the Sacramento River in 1991.

Methyl parathion and malathion - Results of methyl parathion and malathion analyses performed by the DFG laboratory are presented in Tables 8 and 9, respectively. Data from the quality control laboratory (CDFA) are also presented. The highest concentration of methyl parathion in this survey was 0.30 ppb, detected [illegible] collected from the Colusa Basin Drain at CBD5 (Figure 8) on [illegible] entrations detected at CBD1 and SS1 were 0.20 [illegible]ively. The highest malathion concentrations ([illegible] pb at SS1 (May 16) and the 0.20 ppb at CBD1 [illegible]lity control data do not suggest that the DFG d[illegible] methyl parathion or malathion were detect[illegible]r in 1991.

Don Koehler
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MASS TRANSPORT IN THE SACRAMENTO R[illegible]

The total mass of molinate and thiobencarb transported in the Sacramento River past Sacramento may be used to compare the pesticide load in the river in different years. Mass transport cannot be used to determine compliance with performance goals. The estimated mass transport of molinate and thiobencarb in the Sacramento River past Sacramento during 1982 through 1991 is presented in Table 10. The mass transport of molinate in 1991 was estimated to be 99 kg (218 lbs), a reduction of 96.9% from 1990 totals and a 99.5% reduction since 1982. Since thiobencarb was not detected in the Sacramento River in 1991, transport mass is assumed to be zero.

WEATHER AND ITS INFLUENCE ON WATER QUALITY

Weather conditions during and after applications of rice pesticides may influence the performance of water quality control programs. Dissipation rates of many pesticides, e.g. molinate, increase with increasing

temperature, so warm weather during water holding periods helps reduce concentrations once post-application discharges resume. The unusually hot weather in May, 1987 helped explain why concentrations in waterways and mass transport in the Sacramento River were relatively low that year. Conversely, May 1990 was cool and rainy and the results of the molinate program were not successful. Thus, it is important to be aware of weather patterns when reviewing monitoring data.

In 1991, the temperatures during the beginning of the application season for molinate and thiobencarb (Figure 10) were generally much cooler than normal. The weather in the remainder of the application season was more seasonable. The dissipation of rice pesticides from rice field water was probably lower than that expected in a "normal" year, but not to an unusual degree.

WATER FLOW PATTERNS AND THEIR INFLUENCE ON WATER QUALITY

Drought conditions in 1991 reduced flows in many surface waterways, even in those dependent on agricultural return flows. In some cases this provided less dilution for rice field discharges and concentrations may have been higher than in more normal years. For example, Butte Creek previously flowed at volumes sufficient to dilute rice field discharges five-fold at the Butte Slough monitoring site (BS1). No such dilution was possible in 1991 and water sampled at BS1 was essentially all runoff from rice fields. Thus, with more normal flow patterns, concentrations of rice pesticides at that site would probably be much lower. In contrast, flows in the Colusa Basin Drain are highly dependent on return from rice fields and are not appreciably diluted with water from other sources. While water flows in the Colusa Basin Drain were low in 1991 because of low rice acreage and water conservation measures, concentrations of rice pesticides there were probably not greatly affected by the drought.

Low flow volumes in the major agricultural drains also helped minimize inputs into the Sacramento River and concentrations of pesticides measured in the river were very low or not detectable. This also resulted in a great reduction in the mass of molinate and thiobencarb transported in the Sacramento River past Sacramento.

APPLICATION DRIFT AND ITS INFLUENCE ON WATER QUALITY

Aerial applications of pesticides have the potential to move off-site and into adjacent waterways. Evidence suggests that drift had a significant effect on water quality in 1991 and was the most significant contributor of rice pesticides to surface waterways. Indirect evidence for such contributions can be seen by comparing the occurrence of the peak concentrations of molinate, carbofuran and methyl parathion in agricultural drains and the timing of the applications of these pesticides.

The effects of discharges from a treated field on concentrations found at a downstream monitoring site would not be known for at least 28 days following the application, assuming the field water was contained for the 24 day minimum and discharged water took 4 days to travel from the field to the monitoring site. If the presence of pesticides in agricultural drains were due to discharges alone, the highest concentrations would be expected about four weeks following the heaviest application periods in the catchments upstream from the monitoring sites. However, the highest concentrations of molinate occurred well before anticipated discharge peaks and were more closely associated with application periods. Figures 11 and 12 illustrate that the peak concentrations of molinate in the Colusa Basin Drain and Butte Slough, respectively, could not have been due to legal releases 25 days after application.

There is a significant relationship between the number of rice acres treated with molinate in Glenn and Colusa Counties and concentrations of molinate in water samples collected at CBD5 during the application period (correlation coefficient = 0.767, p = 0.0159). For this correlation, five day running averages of rice acres treated with molinate, encompassing the fourth through the eighth days of application prior to the water monitoring sample collection date, allowed for the variable transit times of molinate residues from the sites of application to the monitoring site. Only those molinate concentrations which could not be attributed to legal releases after a minimum 24 day holding period (eight dates between May 4 and June 6) were included in the correlation.

Carbofuran and methyl parathion concentrations in the Colusa Basin Drain also peaked during the application periods, as shown in Figures 13 and 14, respectively. These figures also suggest that the 1991 programs were adequate for reducing discharge and meeting 1991 and 1992 performance goals.

The malathion program included a holding period of only four days and it was not possible to determine whether the occurrence of malathion in waterways was more closely associated with anticipated discharges or with other events.

Empirical data are available which indicate that an important source of methyl parathion contamination is from aerial drift. Research conducted by CDPR in 1991 indicated that during routine methyl parathion applications to rice fields, methyl parathion was deposited into adjacent drainage ditches and to ditch banks. Methyl parathion in these ditches peaked at concentrations ranging from 2.8 to 16.7 ppb above background (0.05 ppb or less) shortly following applications, then concentrations declined as contaminated water moved downstream.

Other potential sources of such contamination at this point in the production schedule for rice include discharge gates (drop boxes) that leak during water holding periods; subterranean movement of treated field water to agricultural drains; and discharges from fields draining under emergency release provisions.

1992 PROGRAM

PROGRAM DESCRIPTIONS

Molinate

The 1992 molinate program is designed to meet water quality objectives and the 1992 performance goal of 10 ppb molinate in Sacramento Valley surface waters. The program will be implemented using restricted material permits conditioned to mitigate water quality problems associated with use. The conditions include:

1. All water treated with products containing molinate must be retained on the site of application for at least 28 days following application unless:

a. the treated water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 29 days following the last application of molinate within the system.

   1. If the system is under the control of one permittee, treated water may be discharged from the application site in a manner consistent with product labeling.

   2. If the system is under the control of more than one permittee, treated water may be discharged from the application site 9 days following application.

b. the treated water is on acreage within the bounds of specific geographic areas that discharge negligible amounts of rice field drainage into the Sacramento River or its tributaries until fields are drained for harvest. All water on fields treated with molinate must be retained on the treated acreage for at least 8 days following application.

2. Fields not specified in 1.a. and 1.b. may resume discharging field water 29 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields may then resume after 7 days.

3. The county agricultural commissioner may authorize the emergency release of tailwater 7 days following application following a review of a written request (Appendix 1) which clearly demonstrates the crop is suffering because of the water management requirements. Additionally, the requester must describe preventative action that would avoid the need for future emergency releases. Under an emergency release variance, tailwater may be released only to the extent necessary to mitigate the documented problem. Those issued an emergency release must submit to the county agricultural commissioner a report (Appendix 2) indicating the time and duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release.

Thiobencarb

Since the 1992 performance goal of thiobencarb is not yet established and since the 1991 thiobencarb program is probably adequate to meet any performance goal that may reasonably be established for thiobencarb, the 1992 thiobencarb will be the same as that used in 1991. The program will be implemented using restricted material permits conditioned to mitigate water quality problems associated with use. The conditions include:

1. All water treated with products containing thiobencarb north of the line defined by Roads E10 and 116 in Yolo County and the American River in Sacramento County must be retained on the treated fields for at least 30 days following application unless:

a. the treated water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 20 days following the last application of thiobencarb within the system.

   1. If the system is under the control of one permittee, treated water may be discharged from the application site in a manner consistent with product labeling.

   2. If the system is under the control of more than one permittee, treated water may be discharged from the application site 7 days following application.

b. the treated water is on acreage within the bounds of specific geographic areas that discharge negligible amounts of rice field drainage into the Sacramento River or its tributaries until fields are drained for harvest. All water on fields treated with thiobencarb must be retained on the treated acreage for at least 6 days following application.

2. All water treated with products containing thiobencarb south of the line defined by Roads E10 and 116 in Yolo County and the American River in Sacramento County must be retained on the treated fields for at least 6 days following application.

Valent Chemical Company, distributor of products which contain thiobencarb, agreed to limit the distribution of thiobencarb for use on properties described in 1 above to 4.4 million pounds or enough to treat 110,000 acres.

Carbofuran

The 1992 carbofuran program will be the same as the 1991 program. It is designed to maintain carbofuran discharges at low levels and to help assure compliance with the 1992 performance goal of 0.4 ppb in Central Valley surface waters. The program will be implemented using restricted material permits that are conditioned to mitigate water quality problems associated with use. Provisions of this program include:

1. Pre-flood applications of carbofuran to rice fields must be incorporated into the soil.

2. Water shall not be discharged from sites treated with carbofuran for at least 24 days following initial flooding (pre-flood application) or following application (post-plant application) unless the treated water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 25 days following the last application of carbofuran within the system.

   a. If the system is under the control of one permittee, treated water may be discharged from the application site in a manner consistent with product labeling.

   b. If the system is under the control of more than one permittee, treated water may be discharged from the application site 9 days following application.

3. The county agricultural commissioner may authorize the emergency release of tailwater 7 days following application following a review of a written request (Appendix 1) which clearly demonstrates the crop is suffering because of the water management requirements. Additionally, the requester must describe preventative action that would avoid the need for future emergency releases. Under an emergency release variance, tailwater may be released only to the extent necessary to mitigate the documented problem. Those issued an emergency release must submit to the county agricultural commissioner a report (Appendix 2) indicating the time and duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release.

Methyl parathion

The 1992 methyl parathion program will be the same as the 1991 program. It is designed to maintain methyl parathion discharges at low levels and to help assure compliance with the 1992 performance goal of 0.13 ppb in Central Valley surface waters. The program will be implemented using restricted material permits that are conditioned to mitigate water quality problems associated with use. Provisions of this program include:

1. Water shall not be discharged from sites treated with methyl parathion for at least 24 days following application unless the treated water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 25 days following the last application of methyl parathion within the system. Treated water may be discharged from the application site in a manner consistent with product labeling.

2. The county agricultural commissioner may authorize the emergency release of tailwater 7 days following application following a review of a written request (Appendix 1) which clearly demonstrates the crop is suffering because of the water management requirements. Additionally, the requester must describe preventative action that would avoid the need for future emergency releases. Under an emergency release variance, tailwater may be released only to the extent

necessary to mitigate the documented problem. Those issued an emergency release must submit to the county agricultural commissioner a report (Appendix 2) indicating the time and duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release.

Malathion

The 1992 malathion program will be the same as the 1991 program. It is designed to maintain malathion discharges at low levels and help, along with efforts to minimize spray drift, to assure compliance with the 1992 performance goal of 0.1 ppb in Central Valley surface waters. The program will consist of a single practice: water should be held on the site of application for at least 4 days following application.

Additional Features

The CDPR will continue efforts to reduce contributions of rice pesticides to surface waterways from two potentially important sources: aerial drift and water discharged under emergency release provisions.

DISCUSSION

Molinate

The 1992 molinate program relies upon the basic strategy used since 1984; mandatory water holding periods following application will be used to allow molinate to dissipate before field water is discharged. By successively increasing the water holding requirements for molinate users, molinate discharges from treated acreage and concomitant concentrations in agricultural drains and the Sacramento River have declined dramatically. In 1991, concentrations due to discharges were apparently so low that other sources of molinate contamination, e.g. drift, were the most significant contributor of molinate to Sacramento Valley waterways. Although it appears that the peak concentrations of molinate in agricultural drains cannot be attributable to discharges from treated fields, such discharges probably loaded enough molinate in agricultural drains to exceed 10 ppb, the performance goal for 1992. Therefore, in order to better meet the 1992 performance goal, even under unfavorable weather conditions, the proposed molinate program increases the water holding requirement for most molinate users from 24 to 28 days. Since the dissipation half-life of molinate is usually between three and four days, increasing the holding period can significantly affect molinate discharges and concentrations in receiving waters.

Thiobencarb

The proposed thiobencarb program is the same as the program implemented in 1991. This program was successful in meeting the 1991 performance goal. Strict water management requirements and a sales limit in the Sacramento Valley of 4.4 million pounds of formulated product will continue to keep thiobencarb concentrations in the surface waters very low and below the 1992 performance goal, anticipated to be 1.5 ppb.

Carbofuran

The proposed carbofuran program is the same as the program implemented in 1991. This program was adequate to meet the 1991 and 1992 performance goals of 0.4 ppb, since the only detection of carbofuran in excess of these goals could not have been the result of discharges from treated fields.

An emergency release provision, similar to that available to molinate users, will be available to carbofuran users.

Methyl Parathion

The proposed methyl parathion program is the same as the program implemented in 1991. This program was adequate to meet the 1991 and 1992 performance goals of 0.26 and 0.13 ppb, respectively, since the only detections of methyl parathion in excess of these goals could not have been the result of discharges from treated fields.

A CDPR study conducted in 1991 demonstrated how rapidly methyl parathion dissipates from rice field water and the value of water holding strategies in reducing methyl parathion discharges. It was estimated that methyl parathion concentrations in field water in of treated rice fields would decline from a post-application peak of 1,890 ppb to 0.38 ppb or lower by the 24th day following application.

An emergency release provision, similar to that available to molinate users, will be available to methyl parathion users.

Malathion

The proposed malathion program is the same as the program implemented in 1991, since it was concluded that the presence of malathion in agricultural drains was not attributable to discharges but rather from aerial drift.

Additional Features

During 1992, CDPR will develop and implement a program to reduce concentrations of rice pesticides in surface waterways due to aerial drift. This may be the most significant component of the 1992 program since aerial drift is now probably the most significant contributor of rice pesticides to surface waterways. The CDPR is considering options which will reduce aerial drift, including conditioning restricted material permits to insure that those who apply molinate, thiobencarb, carbofuran, or methyl parathion to rice fields will take the precautions needed to minimize drift to waterways.

Field water discharged under emergency release provisions must be minimized in order to assure that performance goals are met. Reporting requirements implemented in 1991 will help county agricultural commissioners screen those who apply for emergency releases and better identify those who have a legitimate need for such releases. Emergency release variances should not be issued to those seeking a convenient remedy for poor water management. Those who request variances yearly will be identified and permits may be conditioned to assure that reasonable steps are taken to prevent recurrence.

ADDITIONAL INFORMATION

The rice industry predicts the California rice acreage to be about 350,000 acres in 1992, an increase of about 10% over the 1991 rice acreage. Presumably, the use of rice pesticides will increase accordingly.

Table 1. Acres treated with molinate (Ordram®)[1], thiobencarb (Bolero®), carbofuran (Furadan®), methyl parathion, and malathion in the counties of the Sacramento and San Joaquin Valleys in 1991[2].

	Acres treated				
County	molinate	thiobencarb	carbofuran	methyl parathion	malathion
Butte	64,834	2,251	32,260	3,650	155
Colusa	87,602	7,223	35,388	24,687	1,085
Fresno	1,511	0	0	0	0
Glenn	61,177	647	19,189	6,195	0
Merced	1,272	20	0	0	0
Placer	10,519	1,796	5,637	1,568	540
Sacramento	5,862	1,253	1,698	1,591	824
San Joaquin	4,333	0	718	0	0
Stanislaus	2,034	0	138	0	0
Sutter	53,514	3,555	10,101	12,444	4,352
Tehama	651	0	0	0	0
Yolo	5,344	7,288	453	446	595
Yuba	27,469	66	15,935	7,705	2,221
Totals					
Sacramento Valley	316,972	24,079	120,661	58,286	9,772
San Joaquin Valley	9,150	20	856	0	0
Overall	326,122	24,099	121,517	58,286	9,772

1. Values higher than estimated rice acreage in 1991 because molinate may be applied more than once at each site.

2. Values are based on Notices-of-Application submitted to county agricultural commissioners in the Sacramento Valley, except Colusa and Glenn Counties. Values for use in the San Joaquin Valley and in Colusa and Glenn Counties are based on 1991 Pesticide Use Reports.

Table 2. Acres of molinate-treated rice fields where water was discharged under emergency release variances in the Sacramento Valley in 1987 - 1991.

Year	Acres	Percent of total acres treated
1987	5,712	1.94
1988	4,897	1.41
1989	3,235	0.86
1990	23,394	6.32
1991	2,224	0.70

Table 3. Molinate concentrations at seven monitoring sites[1] in the Sacramento Valley in 1991[2].

	Concentration (ppb)						
Date	CBD1	CBD5	SS1	BS1	SRRUN4	SR1	SR2
5/9	ND[3]	2.3	ND	ND	[4]	ND	ND
5/13	2.9	8.6	ND	ND		ND	ND
5/20	9.2	18	1.1	2.1		ND	ND
5/23	13	16	1.9	5.3		ND	ND
5/27	13	15	5.5	10	1.0	ND	ND
5/30	18	14	5.2	21	ND	1.2	ND
6/3	17	17	6.9	22	1.3	1.3	ND
6/6	16	14	7.5	26	ND	ND	ND
6/10	11	9.6	7.9	10	ND	ND	ND
6/13	10	12	9.6	5.3	ND	ND	ND
6/17	8.7	13	7.4	6.0	ND	ND	ND
6/20	8.1	13	6.2	11		ND	
6/24	7.4	4.0	3.4	7.4		ND	
7/1	3.5	5.1	5.3	6.2		ND	
7/4	3.5	3.4	3.1	5.9		ND	
7/8	3.3	3.0	2.6	5.7		ND	

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   CBD5 Colusa Basin Drain at Highway 20 in Colusa County.
   SS1 Sacramento Slough at DWR gauge station in Sutter County.
   BS1 Butte Slough at Highway 20 in Sutter County.
   SRRUN4 Sacramento River, 3 km downstream from confluence with Colusa Basin Drain.
   SR1 Sacramento River at Village Marina in Sacramento County.
   SR2 Sacramento River at Freeport Bridge in Sacramento County.

2. Samples collected by the California Department of Fish and Game and analyzed by ICI Americas, Inc.

3. ND None detected. Limit of detection = 1.0 ppb.

4. Blanks in table indicate that no samples were taken.

Table 4. Concentrations of molinate and thiobencarb in the Sacramento River at the intake to the City of Sacramento water treatment facility in 1991[1].

Date	Concentration (ppb) molinate	thiobencarb	Date	Concentration (ppb) molinate	thiobencarb
5/10	ND[2]	ND	6/3	0.60	ND
5/14	ND	ND	6/5	ND	ND
5/17	ND	ND	6/7	0.12	ND
5/20	ND	ND	6/10	ND	ND
5/22	ND	ND	6/12	0.12	ND
5/24	0.11	ND	6/14	0.10	ND
5/27	0.20	ND	6/17	ND	ND
5/29	0.25	ND	6/19	ND	ND
5/31	0.19	ND			

1. Samples collected and analyzed by the City of Sacramento.

2. ND None detected. Limits of detection = 0.5 ppb (5/10 - 5/14), 0.10 ppb (5/17 - 6/19).

Table 5. Thiobencarb concentrations at seven monitoring sites[1] in the Sacramento Valley in 1991[2].

	Concentration (ppb)						
Date	CBD1	CBD5	SS1	BS1	SRRUN4	SR1	SR2
5/9	ND[3]	ND	ND	ND	[4]	ND	ND
5/13	ND	ND	ND	ND		ND	ND
5/20	ND	ND	ND	ND		ND	ND
5/23	ND	ND	ND	ND		ND	ND
5/27	ND	ND	ND	ND	ND	ND	ND
5/30	ND	ND	ND	ND	ND	ND	ND
6/3	ND	ND	ND	ND	ND	ND	ND
6/6	ND	ND	ND	ND	ND	ND	ND
6/10	ND	ND	ND	ND	ND	ND	ND
6/13	ND	ND	ND	ND	ND	ND	ND
6/17	ND	ND	ND	ND	ND	ND	ND
6/20	ND	ND	ND	ND		ND	ND
6/24	ND	ND	ND	ND		ND	ND
7/1	ND	ND	ND	ND		ND	ND
7/4	ND	ND	ND	ND		ND	ND
7/8	ND	ND	ND	ND		ND	ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   CBD5 Colusa Basin Drain at Highway 20 in Colusa County.
   SS1 Sacramento Slough at DWR gauge station in Sutter County.
   BS1 Butte Slough at Highway 20 in Sutter County.
   SRRUN4 Sacramento River, 3 km downstream from confluence with Colusa Basin Drain.
   SR1 Sacramento River at Village Marina in Sacramento County.
   SR2 Sacramento River at Freeport Bridge in Sacramento County.

2. Samples collected by the California Department of Fish and Game and analyzed by ICI Americas, Inc.

3. ND None detected. Limit of detection = 1.0 ppb.

4. Blanks in table indicate that no samples were taken.

Table 6. Concentrations of bensulfuron methyl detected at two sites[1] in the Sacramento Valley in 1991[2].

	Bensulfuron methyl (ppb)	
Date	CBD1	SS1
5/30	0.625	ND[3]
6/3	0.800	ND
6/6	0.750	ND
6/10	0.825	ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   SS1 Sacramento Slough at DWR gauge station in Sutter County.

2. Samples collected by the California Department of Fish and Game and analyzed by Morse Laboratories under contract with Du Pont.

3. ND None detected, limit of detection = 0.5 ppb.

Table 7. Concentrations of carbofuran (Furadan®) detected in Sacramento Valley waterways[1] in 1991, reported by two laboratories[2,3].

Date Collected	Carbofuran (ppb)						
	CBD1		CBD5		SS1		SR1
	FMC	CDFG	FMC	CDFG	FMC	CDFG	FMC
4/15			ND[4]				
4/18			0.1				
4/22		ND	ND			ND	
4/25			ND				
4/29		ND	ND			ND	
5/2			ND				
5/6		ND	ND	ND			
5/9			0.6				
5/13		ND	0.1	ND			
5/16			0.3				
5/20		ND	0.2	ND			
5/27		ND	0.3	ND		ND	
6/3		ND	0.2	ND		ND	
6/6			0.2				
6/10			0.4				
6/13			0.1				
6/17		ND		ND		ND	
6/24		ND		ND		ND	

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   CBD5 Colusa Basin Drain at SR 20 in Colusa County.
   SS1 Sacramento Slough at DWR gauge station in Sutter County.
   SR1 Sacramento River at Village Marina in Sacramento County.

2. CDFG California Department of Fish and Game, Water Pollution Control Laboratory, Rancho Cordova.
   FMC FMC Corporation, Agricultural Chemical Group, Richmond, CA.

3. Data are current as of January 9, 1992. FMC will report additional analytical results for samples collected from CBD1, CBD5, SS1, and SR1.

4. ND None detected, limit of detection = 0.1 ppb. FMC reported a limit of quantitation of 0.4 ppb.

Table 8. Concentrations of methyl parathion detected in Sacramento Valley waterways[1] in 1991, reported by two laboratories[2].

Date Collected	Methyl parathion (ppb)						
	CBD1		CBD5		SS1		SR1
	CDFG	CDFA	CDFG	CDFA	CDFG	CDFA	CDFG
5/2	ND[3]		ND		ND		ND
5/6	ND	ND	ND	ND	ND		ND
5/9	ND		ND		ND		ND
5/13	ND	ND	ND	0.17	ND		ND
5/16	ND		ND		ND		ND
5/20	0.10	0.12	0.20	0.23	ND		ND
5/23	0.20		0.30		ND		ND
5/27	ND	0.12	ND	0.08	0.10	0.14	ND
5/30	ND		ND		ND		ND
6/3	0.10	0.09	0.10	0.09	ND	ND	ND
6/5	ND		ND		ND		ND
6/10		ND		ND		ND	
6/13	ND		ND		ND		ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   CBD5 Colusa Basin Drain at SR 20 in Colusa County.
   SS1 Sacramento Slough at DWR gauge station in Sutter County.
   SR1 Sacramento River at Village Marina in Sacramento County.

2. CDFG California Department of Fish and Game, Water Pollution Control Laboratory, Rancho Cordova.
   CDFA California Department of Food and Agriculture, Chemistry Laboratory Services, Sacramento.

3. ND None detected, limits of detection = 0.10 ppb (CDFG) and 0.05 ppb (CDFA).

Table 9. Concentrations of malathion detected in Sacramento Valley waterways[1] in 1991, reported by two laboratories[2].

Date Collected	Malathion (ppb)						
	CBD1		CBD5		SS1		SR1
	CDFG	CDFA	CDFG	CDFA	CDFG	CDFA	CDFG
5/2	ND[3]		ND		ND		ND
5/6	ND	ND	ND	ND	ND		ND
5/9	ND		ND		ND		ND
5/13	ND	ND	ND	ND	ND		ND
5/16	ND		ND		0.30		ND
5/20	ND	ND	ND	0.05	ND		ND
5/23	ND		ND		ND		ND
5/27	ND	0.11	0.20	0.12	ND	ND	ND
5/30	ND		0.20		ND		ND
6/3	ND	ND	ND	ND	ND	ND	ND
6/5	ND		ND		ND		ND
6/10		ND		ND		ND	
6/13	ND		ND		ND		ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   CBD5 Colusa Basin Drain at SR 20 in Colusa County.
   SS1 Sacramento Slougn at DWR gauge station in Sutter County.
   SR1 Sacramento River at Village Marina in Sacramento County.

2. CDFG California Department of Fish and Game, Water Pollution Control Laboratory, Rancho Cordova.
   CDFA California Department of Food and Agriculture, Chemistry Laboratory Services, Sacramento.

3. ND None detected, limits of detection = 0.10 ppb (CDFG) and 0.05 ppb (CDFA).

Table 10. Estimated mass transport of molinate and thiobencarb in the Sacramento River past Sacramento in the years 1982-1991.

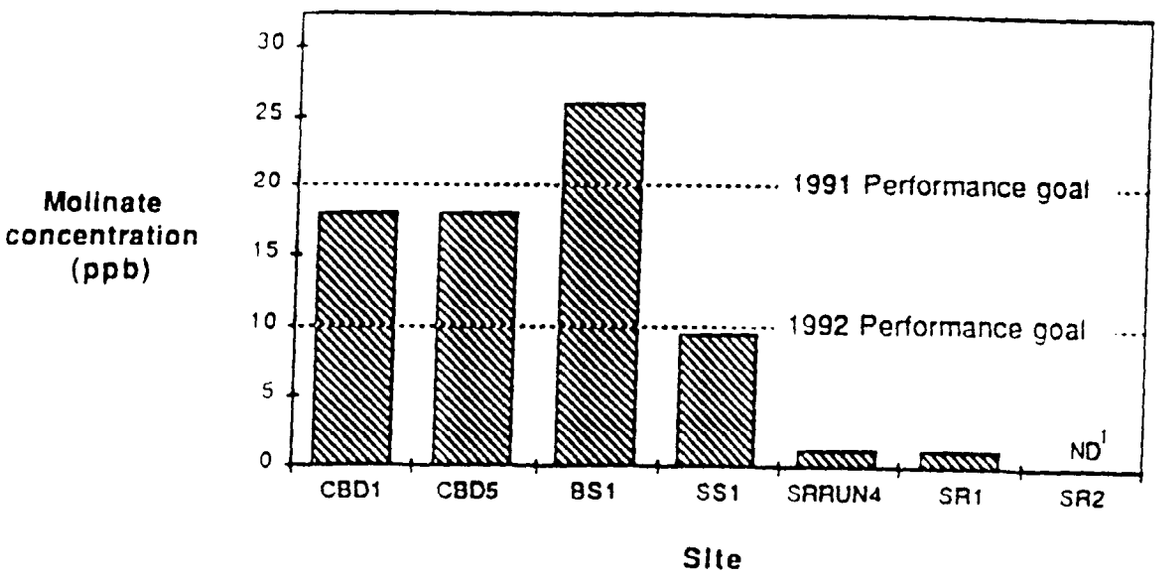
Year	Kg (pounds) Transported			
	molinate		thiobencarb	
1982	18,464.9	(40,666.9)	[1]	
1983[2]	2,752.9	(6,056.5)	623.7	(1,372.2)
1984	7,352.0	(16,174.4)	715.2	(1,573.5)
1985	6,014.8	(13,232.5)	2,317.5	(5,098.6)
1986	4,622.1	(10,168.7)	845.7	(1,860.6)
1987	2,342.3	(5,153.2)	22.8	(50.2)
1988	3,194.2	(7,027.2)	68.1	(149.8)
1989	1,984.1	(4,365.1)	11.4	(25.1)
1990	3,204.1	(7,049.1)	51.4	(113.1)
1991	99.2	(217.9)	0	(0)[3]

1. Mass transport was not calculated due to incomplete monitoring data.

2. The Colusa Basin Drain, a major agricultural drain, did not contribute to the mass transport at Sacramento because the drain was routed into the Yolo Bypass during unusually high Sacramento River flows.

3. Thiobencarb was not detected in the Sacramento River in 1991 (limit of detection = 0.1 ppb).

Figure 2. Peak molinate concentrations in Sacramento Valley waterways in 1991 and molinate performance goals for 1991 and 1992.



ND None detected. Limit of detection = 1.0 ppb.

Figure 3. Peak molinate concentrations in the Colusa Basin Drain near Knight's Landing (CBD1) in 1981-1991 and molinate performance goals.

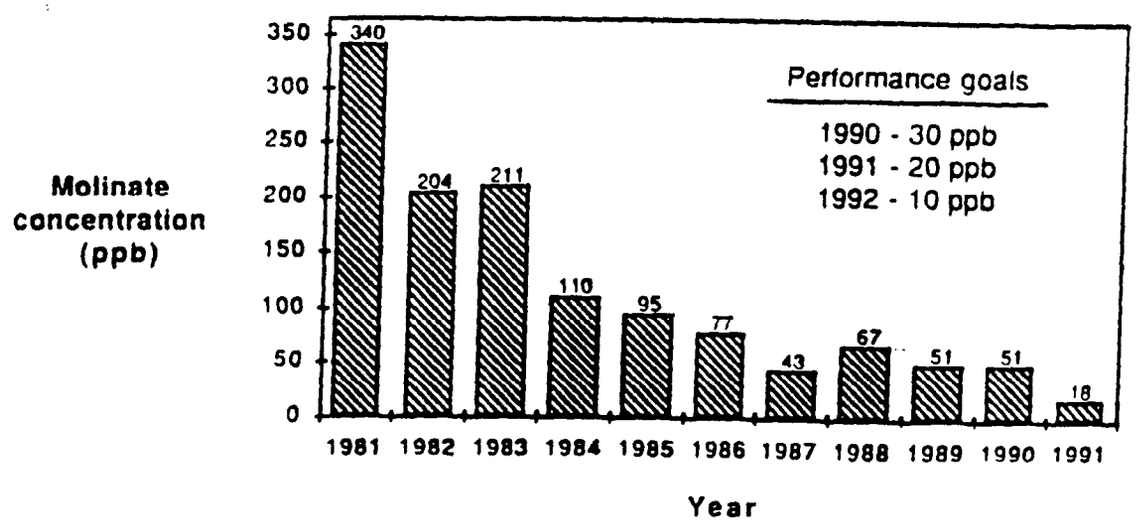


Figure 4. Peak molinate concentrations in the Sacramento River at Sacramento in 1982-1991 and the maximum contaminant level for molinate.

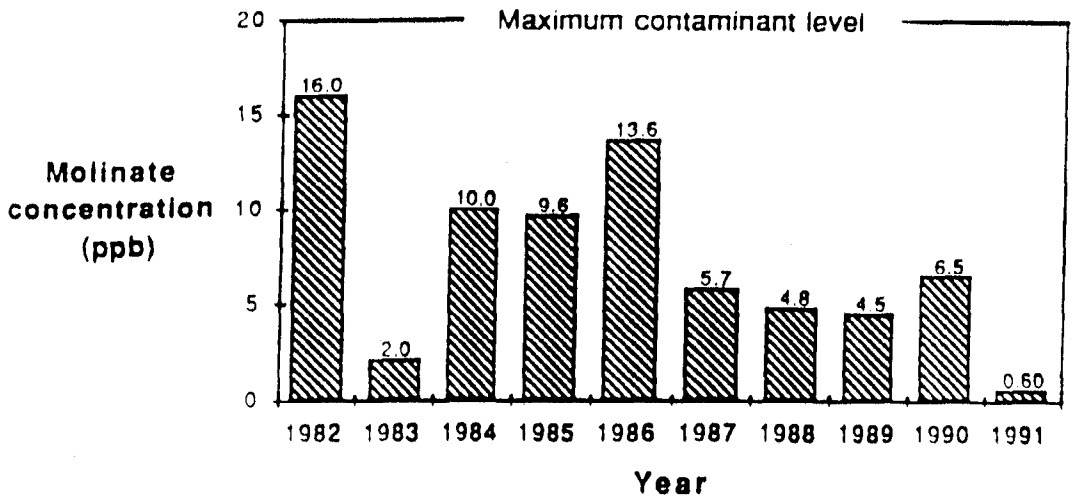


Figure 5. Peak thiobencarb concentrations in the Colusa Basin Drain near Knight's Landing (CBD1) in 1981-1991 and thiobencarb performance goals.

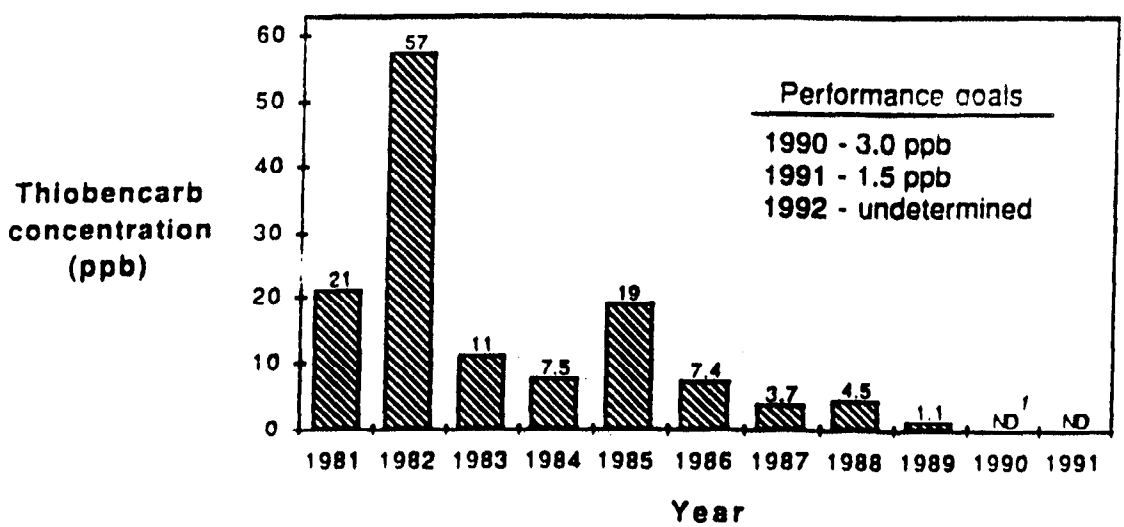
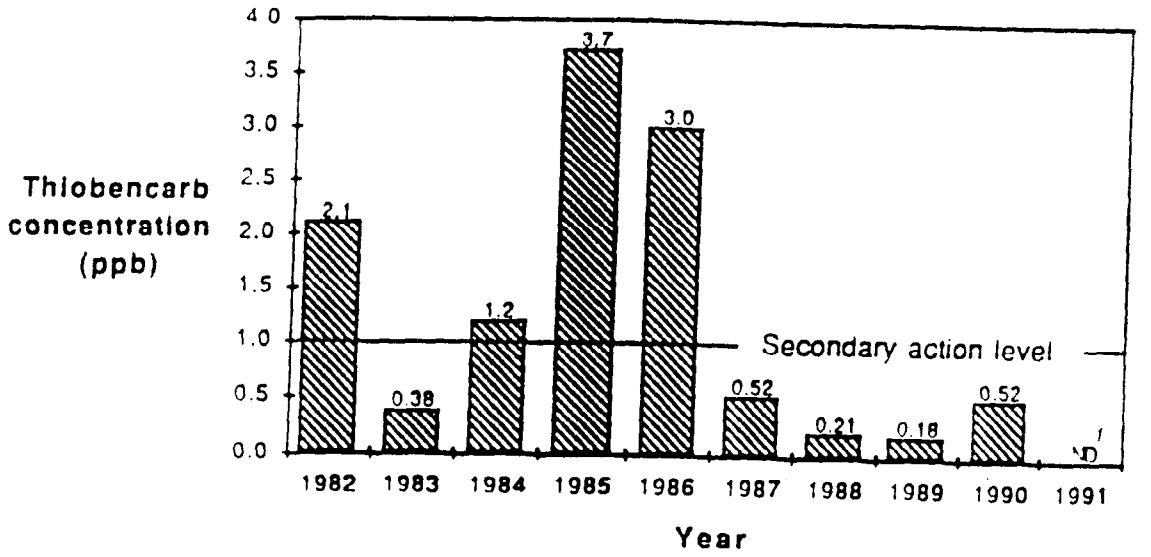
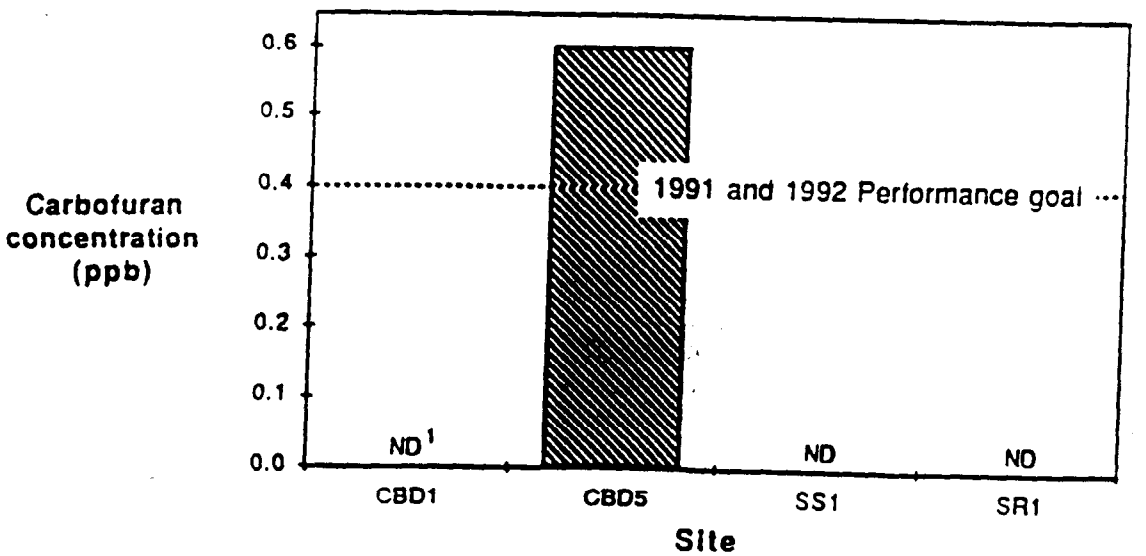


Figure 6. Peak thiobencarb concentrations in the Sacramento River at Sacramento in 1982-1991 and the secondary action level for thiobencarb.



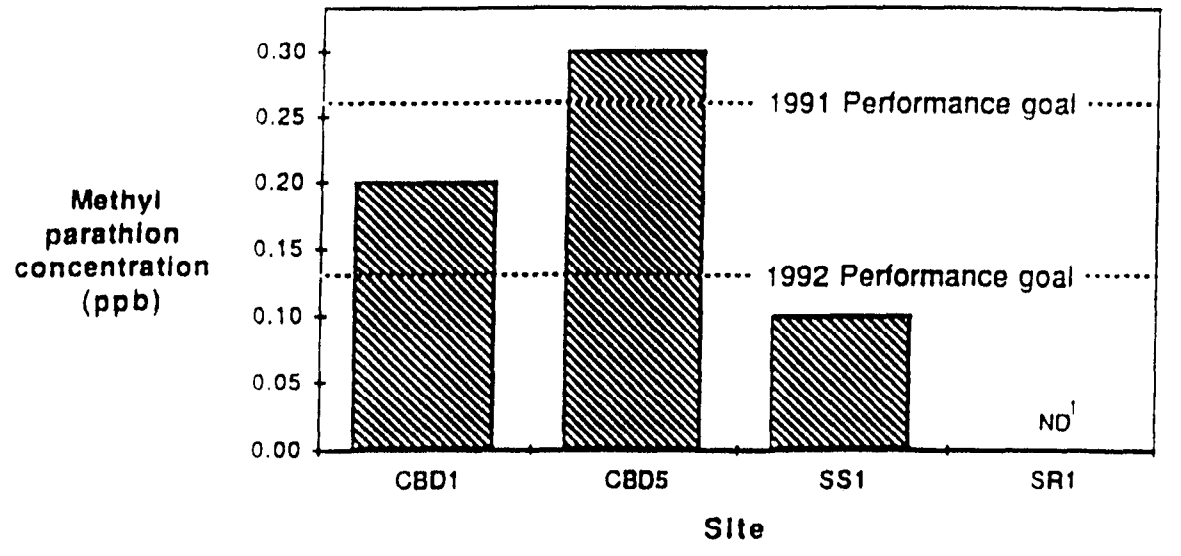
ND None detected. Limit of detection = 0.1 ppb.

Figure 7. Peak carbofuran concentrations in Sacramento Valley waterways in 1991 and carbofuran performance goals for 1991 and 1992.



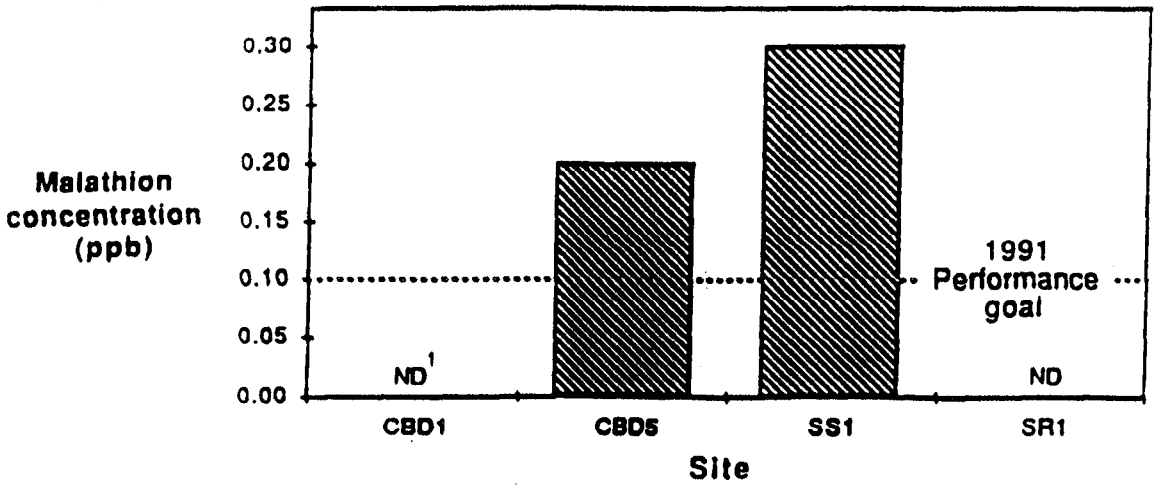
ND None detected. Limit of detection = 0.4 ppb.

Figure 8. Peak methyl parathion concentrations in Sacramento Valley waterways in 1991 and methyl parathion performance goals for 1991 and 1992.



ND None detected. Limit of detection = 0.1 ppb.

Figure 9. Peak malathion concentrations in Sacramento Valley waterways in 1991 and the malathion performance goal for 1991.



ND None detected. Limit of detection = 0.1 ppb.

Figure 10. Acres treated with molinate (open bars) and thiobencarb (filled bars) in the Sacramento Valley in 1991, the deviation of maximum daily temperatures from the 30 year maximum temperatures, and the single rain event over 0.25 inches (arrow).

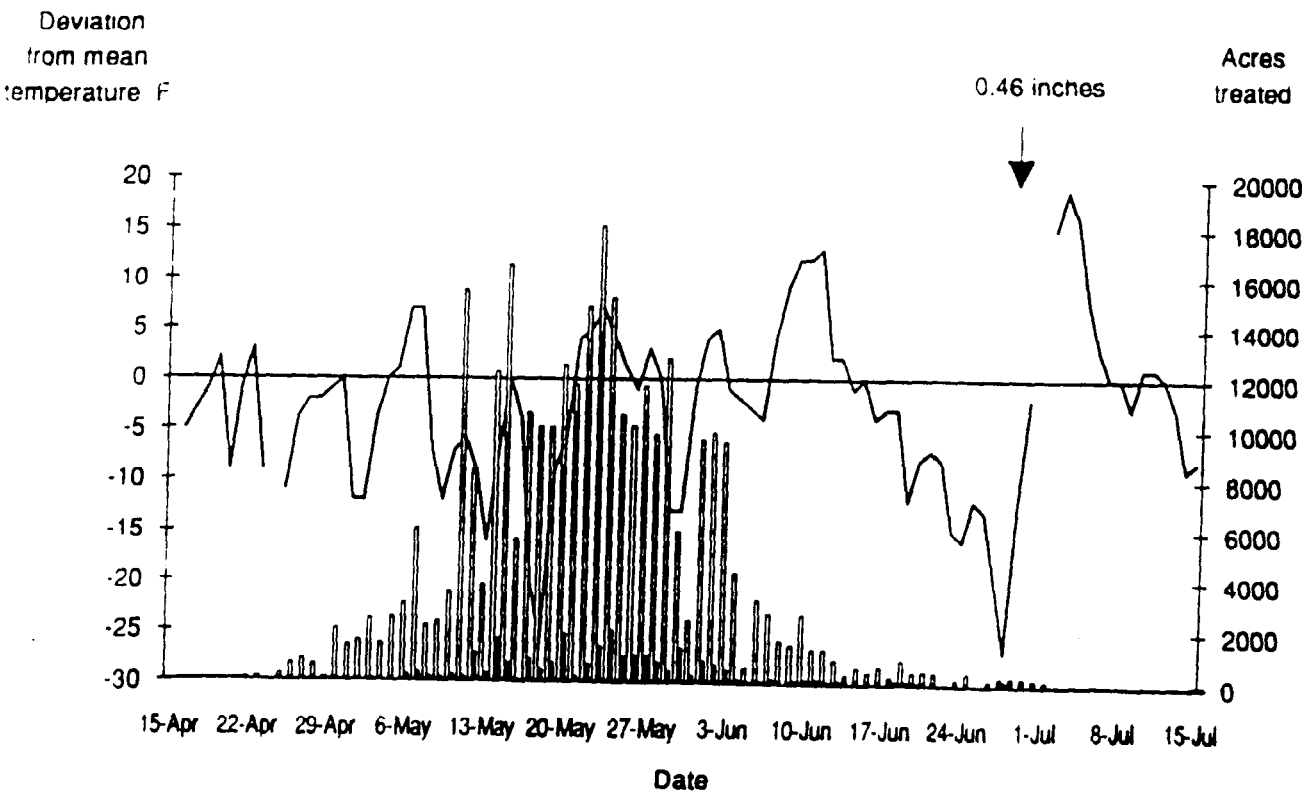


Figure 11. Acres of rice treated with molinate in Glenn and Colusa Counties (bars) and concentrations of molinate in water samples collected from the Colusa Basin Drain at SR20 (CBD5) (squares) in 1991.

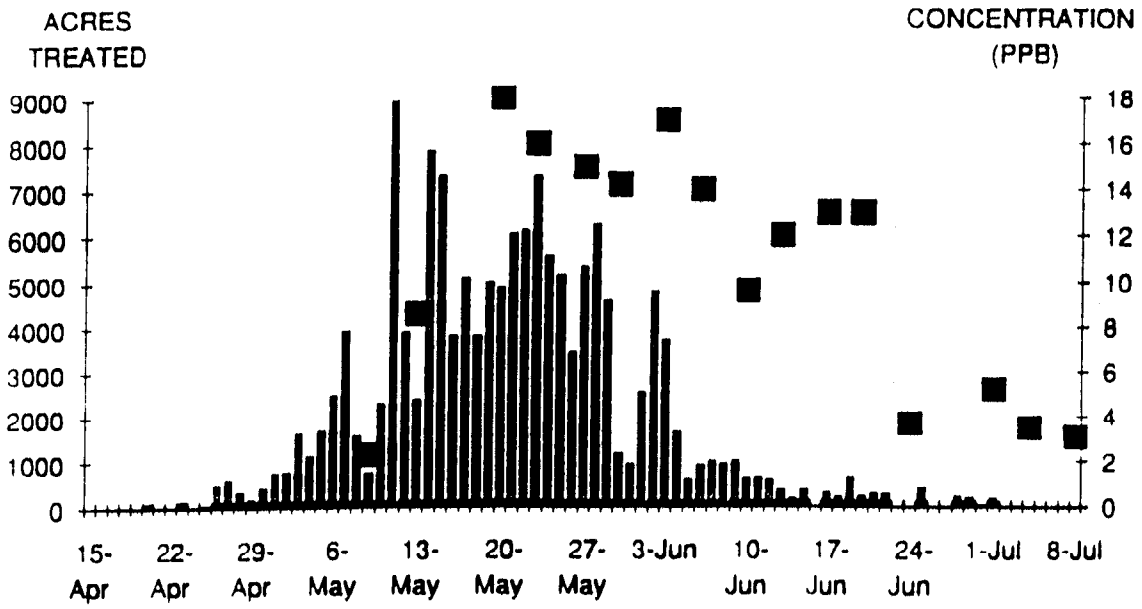


Figure 12. Acres of rice treated with molinate in Butte County (bars) and concentrations of molinate in water samples collected from Butte Slough at SR20 (BS1) (squares) in 1991.

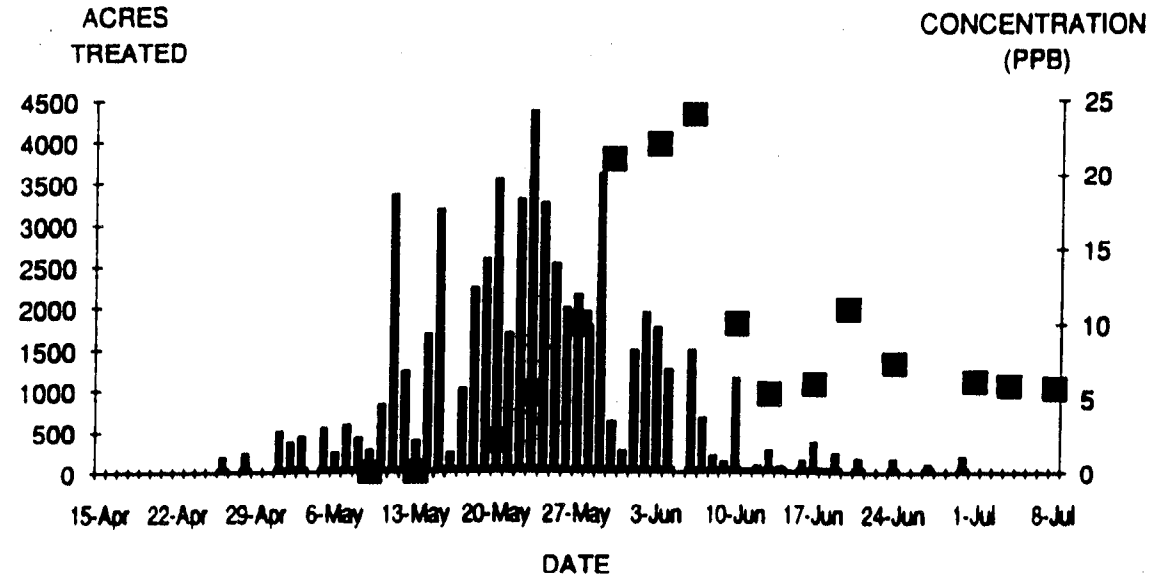


Figure 13. Acres of rice treated by air with carbofuran in Glenn and Colusa Counties (bars) and concentrations of carbofuran in water samples collected in the Colusa Basin Drain at SR20 (CBD5) (squares) in 1991.

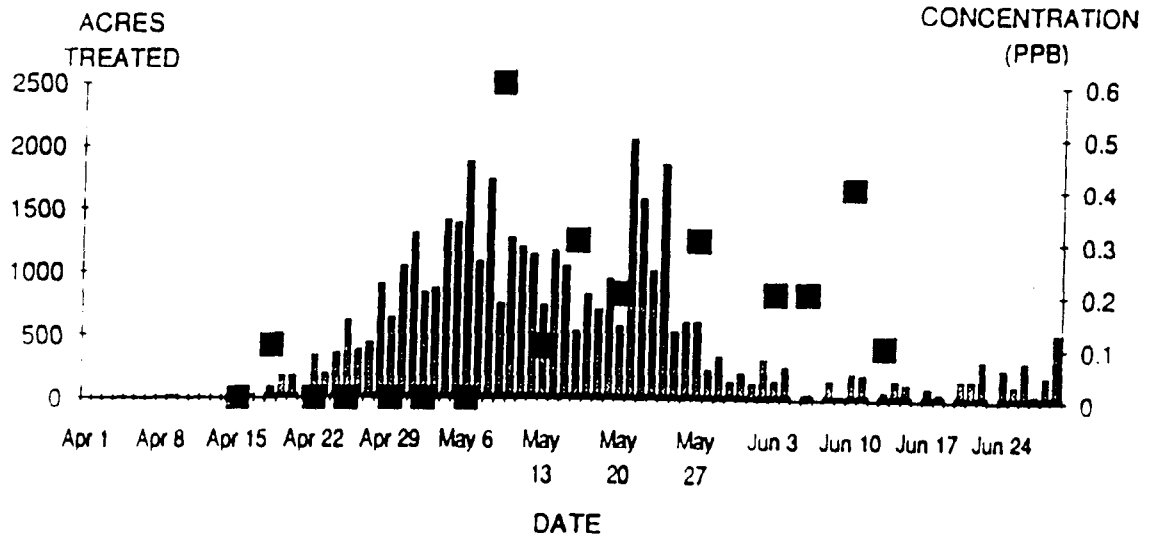
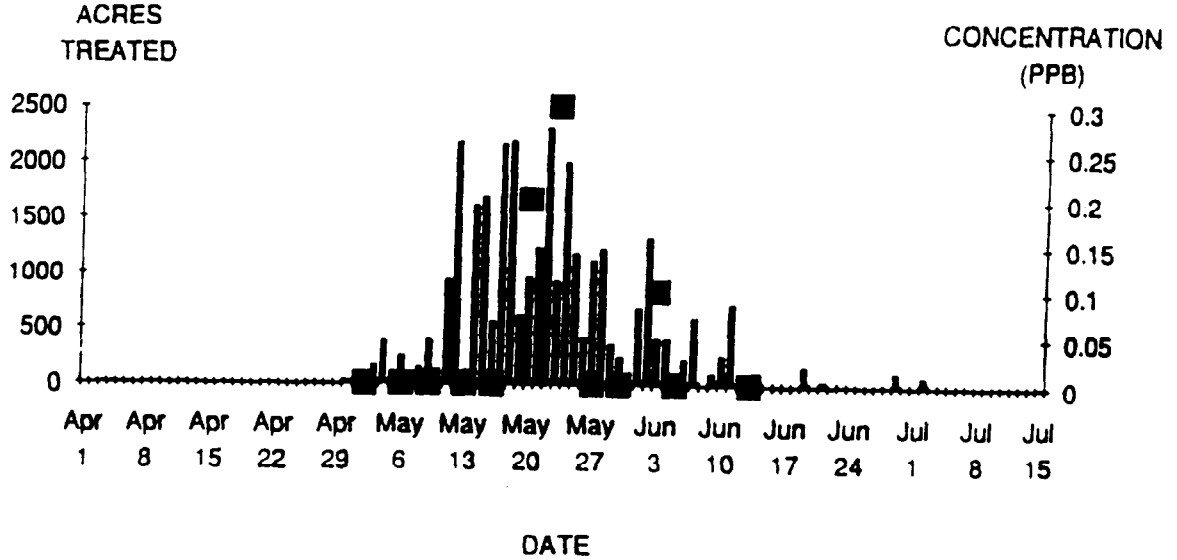


Figure 14. Acres of rice treated by air with methyl parathion in Glenn and Colusa Counties (bars) and concentrations of methyl parathion in water samples collected from the Colusa Basin Drain at SR20 (CBD5) (squares) in 1991.



Appendix 1

FURADAN (Carbofuran), METHYL PARATHION, AND ORDRAM (Molinate)

EMERGENCY RELEASE

Grower:_____ Permit No.:_____

Address:_____ Zip:_____

Field location:_____ Site No.:_____
(Attach detailed map)

Chemical applied:_____
Rate of application:_____
Date of application:_____
Average water depth
at time of application:_____

Chemical applied:_____
Rate of application:_____
Date of application:_____
Average water depth:_____
at time of application:_____

Chemical applied:_____
Rate of application:_____
Date of application:_____
Average water depth
at time of application:_____

Chemical applied:_____
Rate of application:_____
Date of application:_____
Average water depth
at time of application:_____

Starting date of emergency release:_____

Acres in field:_____ Laser leveled? Yes_____ No_____

Type of irrigation system: Flow through____ Recycle____ Static____ Other____

Date flooding began:_____ No. of days it takes to fill field:_____

Describe problem that led to emergency release:_____

_____

Steps that can be taken to prevent emergency releases from this field in future years:_____

_____

_____

Recommendation (attached) by:_____

Application by:_____

Grower's signature:_____ Date:_____

Approved by:_____
Agricultural Biologist

Appendix 2

EMERGENCY RELEASE FORM

Grower: _____ Permit No.: _____

Address: _____ Zip: _____

Field location: _____ Site No.: _____

Beginning date of release: _____ Ending date: _____

The grower must determine the amount of water discharged during the emergency release period. To do this, measure the width of each weir opened to allow the discharge. Then, on a daily basis, measure the height of water flowing over each weir. Record all information in the table below.

WEIR #1		WEIR #2		WEIR #3	
Width:		Width:		Width:	
Date	Height of water	Date	Height of water	Date	Height of water

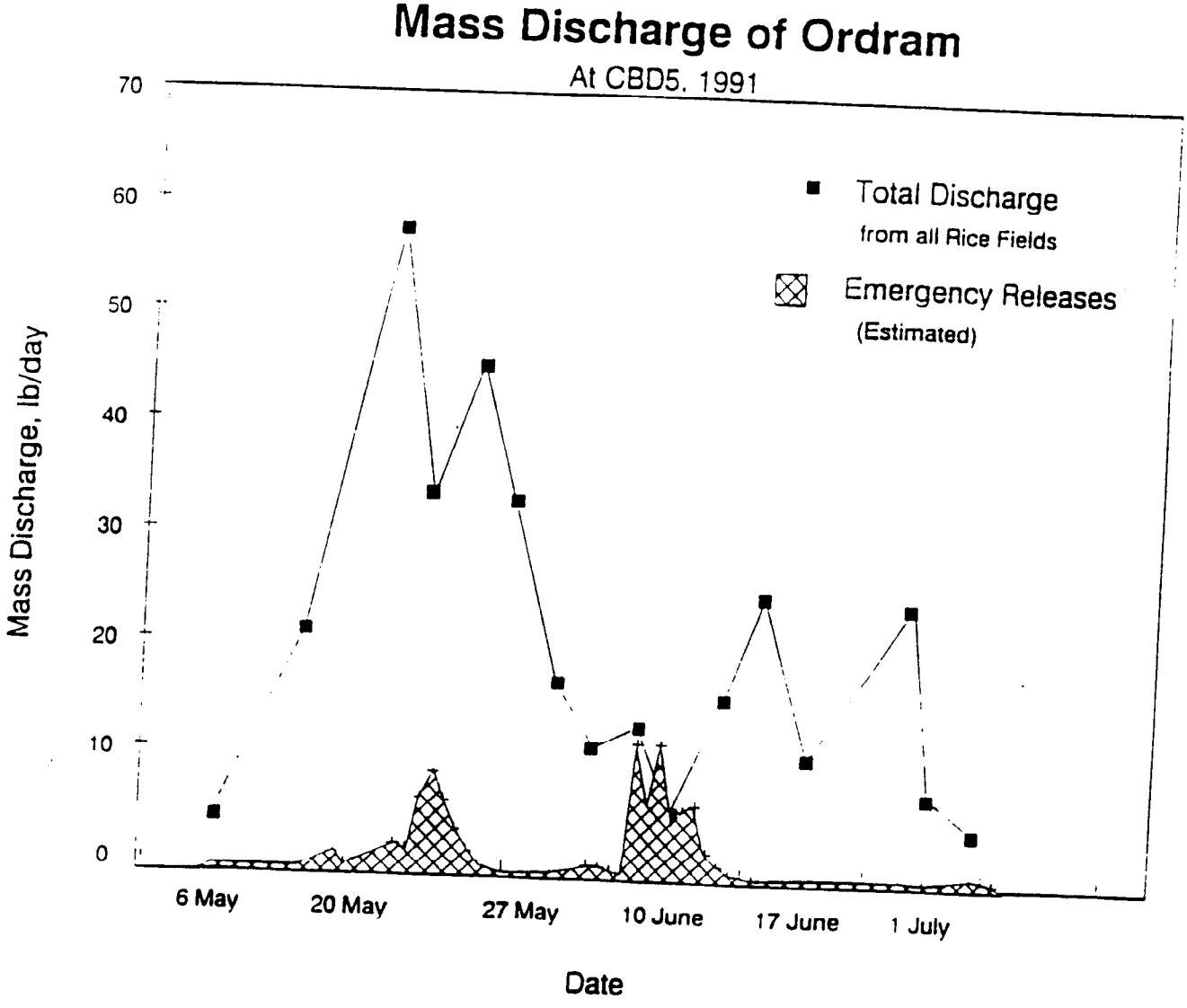
1991 MALATHION USE

The Central Valley Regional Water Quality Control Board has approved a water management practice following malathion use in rice that will help meet 1991 performance goals for malathion in surface water. Malathion is currently not a restricted material and not subject to use requirements or permit conditions. However, it is important that growers comply with this practice.

Water treated with malathion should be held on the site of application for at least four days following application.

Water quality monitoring will be conducted in 1991 to determine the adequacy of this practice in decreasing malathion discharges. In 1990, malathion monitoring levels exceeded 1991 performance goals approximately six fold. If malathion levels are not adequately reduced, a more formal regulatory program may be implemented in future years.

ATTACHMENT 3



ate of California

ATTACHMENT 4

Memorandum

Date

February 20, 1991

Mr. William A. Crooks, Executive Officer
California Regional Water Quality
Control Board - Central Valley Region
3443 Routier Road, Suite A
Sacramento, CA 95827-3098

rom Department of Fish and Game

ubject: Performance Goals for Methyl Parathion

The California Department of Fish and Game (CDFG) has the following comments regarding the Department of Food and Agriculture (CDFA) 1991 Management Practices for Rice Pesticides, considered at the February 22, 1991, Regional Board meeting. CDFG believes that a significant hazard to aquatic organisms, particularly to the estuarine mysid Neomysis mercedis in the Sacramento-San Joaquin Estuary, exists from the use of methyl parathion on rice. Methyl parathion caused significant mortality to aquatic invertebrates for a two-week period in 1990. This information came from a cooperative study conducted by CDFG, Regional Board, and CDFA. CDFG made a request to CDFA on October 9, 1990, to place methyl parathion use on rice into the formal reevaluation process.

The Performance Goal for the 1991 rice growing season of 0.26 ug/L methyl parathion, as adopted in Resolution No. 90-028, is too high and in excess of the 96-h LC50 value of 0.20 ug/L methyl parathion for N. mercedis. The Performance Goal for the 1992 rice growing season of 0.13 ug/L methyl parathion also will not protect aquatic life. Currently, CDFG is conducting studies to facilitate protective water quality criteria for methyl parathion. Our recommendations should be available prior to the 1992 rice growing season and will be protective of long-term exposure and sublethal effects.

The proposed CDFA Management Practices for the 1991 rice growing season, of not allowing the discharge of methyl parathion until 25 days following application, should lower environmental levels of this insecticide. CDFG will be scrutinizing closely the environmental levels of methyl parathion this year to determine whether additional restrictions or management practices will be necessary to lower levels and lessen the impact on aquatic animals.

We will keep your staff and CDFA informed on the progress of our studies, and at the appropriate time, we will petition the Regional Board to adopt new criteria for methyl parathion. Please contact Mr. Brian Finlayson, Supervisor of our Pesticide Investigations Unit at (916) 355-0136 if you need additional information or clarification.

Pete Bontadelli
Director

cc: Mr. Henry Voss, Director
California Department of Food and Agriculture

Mr. Ronald Oshima, Chief
Environmental Monitoring and Pest Management
California Department of Food and Agriculture